Vol. 1 of 1

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Software Requirements Specification
for the
Joint Mapping Tool Kit (JMTK) Functional Area
of the
Defense Information Infrastructure (DII)
Common Operating Environment (COE)

Prepared for:

National Imagery and Mapping Agency
4600 Sangamore Road
Bethesda, MD 20816-5003

Approved by_____

Date_____

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1.0 SCOPE

1.1 Identification

This is version 2.0 of the Software Requirements Specification (SRS) for Joint Mapping Toolkit (JMTK). The JMTK represents the Mapping, Charting, Geodesy, and Imagery (MCG&I) functionality for the Global Command and Control System (GCCS) under the Defense Information Infrastructure Common Operating Environment (DII COE). The JMTK is one of the common support applications of the Defense Information Infrastructure (DII) Common Operating Environment (COE). (See Figure 1-1.)

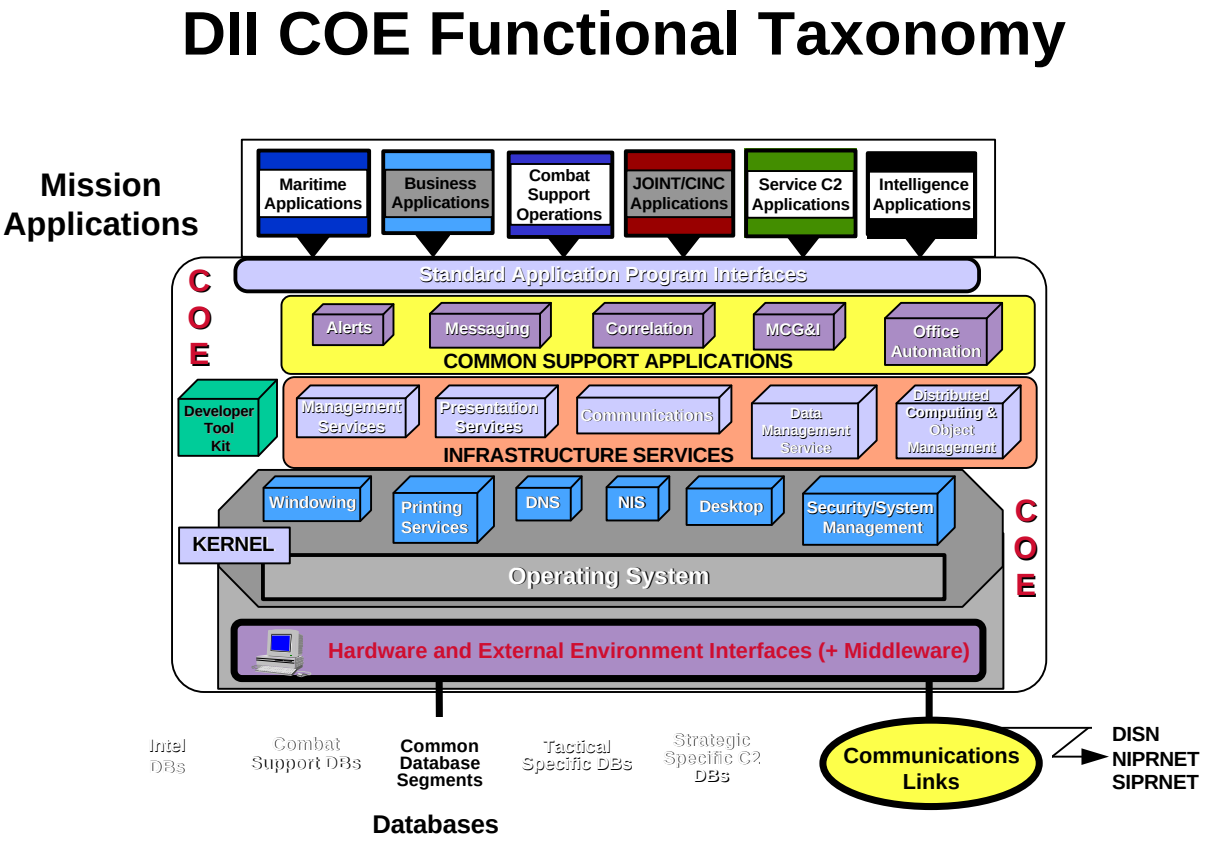

Figure 1.1-1. A depiction of the DII COE functional taxonomy.

Version 2.0 of the JMTK SRS is a major revision to the SRS released by DISA (April 22, 1997), (DMA submission: Release 1.0, 9 October 1995). Version 2.0 was prepared to incorporate imagery as well as additional service and agency requirements.

1.2 System Overview

1.2.1 Common Operating Environment Overview

The DII COE is intended for use by all United States Department of Defense (DoD) Command, Control, Communications, Computer, and Intelligence (C^4I) Systems and Automated Information Systems (as the infrastructure on which they reside). The COE is defined as an integrated

collection of hardware and software that provides standardized and modular system and applications support for mission applications.

Goals of DII COE development are:

- Interoperability at all levels of C^4I operation,
- Reusability of software,
- Common, intuitive human-computer interface, and
- Code portability.

1.2.2 Joint Mapping Toolkit

JMTK is a toolkit whose capabilities are accessed via Application Programmer Interfaces (APIs). It consists of APIs and computer software running on UNIX workstations. JMTK components are combined to yield specific configurations designed to support a variety of users at various locations. The JMTK is an open system capable of running on any COE approved platform. The current approved Commercial Off-the-Shelf (COTS) hardware platforms are Hewlett Packard (HP) 9000/700 series workstations (Tactical Advanced Computer, version 3/4 [TAC-3/TAC-4]) and SUN SPARC 10/20/series workstations and SUN 1000/2000 series servers running under UNIX, and client hardware platforms running under Windows NT (with servers under NT soon to be included). Currently, the DII COE release 3.x software platforms are Sun Solaris (Version 2.5.1) and HP UX (Version 10.20) with OS compatible versions of X-Windows and Motif. Ultimately, the JMTK is to be hardware independent and operational on a range of open system platforms running under standards-based operating systems designated by DII COE. In the interim, the aim is to at least identify, isolate, and minimize hardware dependencies.

The JMTK provides common geospatial processing and data to all mission applications and users within the COE. JMTK services consist of a set of geospatial processing components, some of which interface with other COE elements. JMTK provides visualization, analysis, and spatial database management software capabilities for standard geographical information types. JMTK functional services are divided into the following five functional areas, or domains:

- Domain 1: Analysis (e.g., terrain analysis, line of sight),
- Domain 2: Visual (display of maps and areas of interest),
- Domain 3: Spatial Database Management (NIMA products as well as files generated by JMTK),
- Domain 4 - Local Image Manipulation (e.g., satellite, photograph), and
- Domain 5 - Utilities.

An architecture diagram of JMTK as currently conceived is provided in Figure 1.2.2-1.

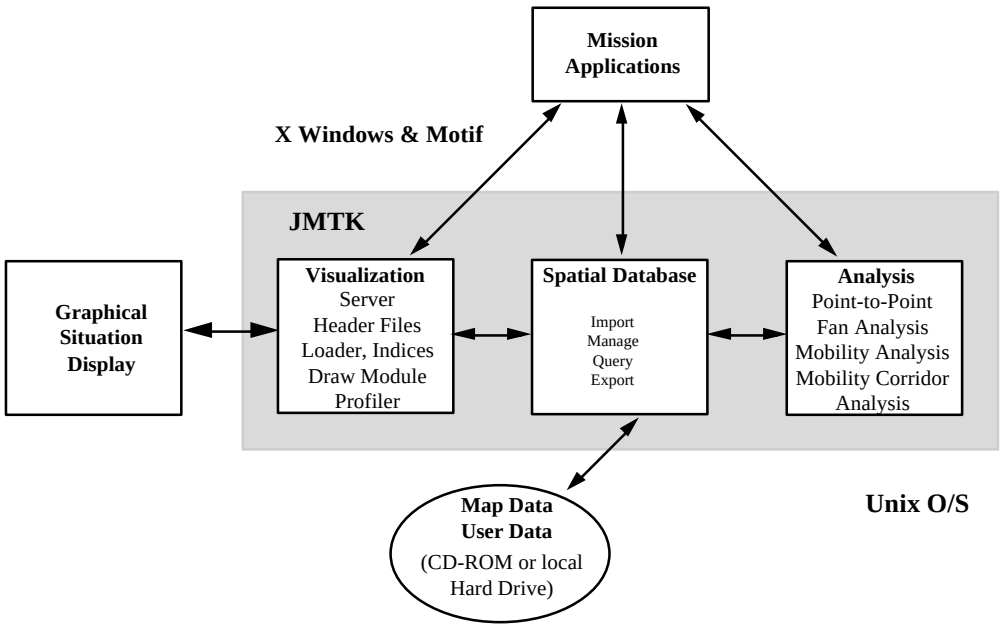

Figure 1.2.2-1. A representation of current JMTK architecture.

1.3 Document Overview

This document outlines the software capabilities required for the JMTK module of the DII COE and consists of the following sections:

- Section 1 identifies the scope and provides an overview of the JMTK;
- Section 2 lists the documents applicable to this specification;
- Section 3 provides a list of functional capabilities requirements;
- Section 4 identifies the qualification provisions;
- Section 5 defines the traceability methodologies needed to account for JMTK requirements;
- Section 6 contains the applicable notes associated with JMTK;

2.0 REFERENCED DOCUMENTS

The following documents form a part of this specification to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this specification, the contents of this specification will be considered the governing requirement.

2.1 Government Documents

MIL-HDBK-850. Glossary of Mapping, Charting, and Geodetic Terms. 21 January 1994.

MIL-STD-2525A. Common Warfighting Symbology. FINAL DRAFT. 9 August 1996.

Defense Information Systems Agency, Center for Computer System Engineering. Architectural Design Document for the Defense Information Infrastructure (DII) Common Operating Environment (COE). January 1996.

Defense Information Systems Agency. Defense Information Infrastructure (DII) Common Operating Environment (COE) Baseline Specifications. 31 October 1996.

Defense Information Systems Agency, Center for Architecture. Department of Defense Technical Architecture for Information Management. Vol. 7: Adopted Information Technology Standards (AITS). Version 2.1. 2 August 1994.

Defense Information Systems Agency, Center for Architecture. Department of Defense Technical Architecture Framework for Information Management (TAFIM), Volumes 1-8: Version 3.0 (Draft). 30 September 1995.

Defense Information Systems Agency. User Interface Specifications for the Defense Information Infrastructure. Version 2.0. 1 April 1996.

Institute for Defense Analysis. Software Requirements Specification the Defense Information Infrastructure (DII) Common Operating Environment (COE) Platform Services. Version 0.1. April 22, 1996.

NIMA. Software Requirements Specification for the Joint Mapping Tool Kit (GCCS/JMTK) of the Global Command and Control System (GCCS) Common Operating Environment (COE). Version 1. 9 October 1995.

NIMA. Establish Priorities (Ad Hoc Technical Report) for the Joint Mapping Toolkit (GCCS/JMTK) of the Global Command and Control System (GCCS) Common Operating Environment (COE). 14 June 1996.

3.0 REQUIREMENTS

The Mapping, Charting, Geodesy, and Imagery (MCG&I) requirements for the JMTK are: geospatial analysis, display, spatial database management, processing of local imagery and utilities.

3.1 Required States and Modes

The states and modes in which the JMTK operate will be determined by the higher level application software that uses it, and is therefore, transparent to this common support application.

3.2 CSCI Capability Requirements

Para #	DESCRIPTION	SRS Ver
3.2. 1	**Spatial Analysis**	V1
3.2. 1.1	**Shall support application selection of input and output units of measurement for all functions.**	V1
3.2. 1.1.1	The variety of units	V1
3.2. 1.1.1.1	Date	V1
3.2. 1.1.1.2	Hour	V1
3.2. 1.1.1.3	Minute	V1
3.2. 1.1.1.4	Second	V1
3.2. 1.1.1.5	Feet	V1
3.2. 1.1.1.6	Meters	V1
3.2. 1.1.1.7	Fathoms	V1
3.2. 1.1.1.8	Kilometers	V1
3.2. 1.1.1.9	Square kilometers	V1
3.2. 1.1.1.10	Hectares	V1
3.2. 1.1.1.11	Nautical miles	V1
3.2. 1.1.1.12	Square miles	V1
3.2. 1.1.1.13	Degrees	V1
3.2. 1.1.1.14	Minutes of arc	V1
3.2. 1.1.1.15	Seconds of arc	V1
3.2. 1.1.1.16	Radians.	V1
3.2. 1.1.1.17	Day(s).	V2
3.2. 1.1.1.18	Statute miles.	V2
3.2. 1.1.1.19	Provide time zone parameter. Default shall be Zulu	V2
3.2. 1.1.1.20	Latitude/Longitude coordinates require datum parameter. Default shall be WGS-84.	V2
3.2. 1.1.1.21	Height/Elevation parameter requires specification of vertical datum - MSL or ellipsoid. Default shall be MSL.	V2
3.2. 1.1.1.22	Mils	V2
3.2. 1.1.2	Input of degrees shall allow the input in several formats which include:	V1
3.2. 1.1.2.1	Degrees, minutes seconds mode.	V1
3.2. 1.1.2.2	Degree, decimal degree.	V1
3.2. 1.1.2.3	Degree, minute, and decimal minute.	V1

3.2. 1.1.2.4	Entry of degrees shall allow for at least seven decimal places.	V1
3.2. 1.1.2.5	Entry of seconds shall allow for at least three decimal places.	V1
3.2. 1.1.2.6	Entry of hemisphere shall be allowed in (NSEW) and (+-) format.	V1
3.2. 1.1.3	The time and date format shall be transmitted and entered in the YYYYMMDD. HHMMSS.	V1
3.2. 1.1.4	Set the unit of measurement to be used in the display of all angle calculations.	V1
3.2. 1.1.5	Set the unit of measurement for the display of all elevation calculations.	V1
3.2. 1.1.6	Set the unit of measurement for the display of all position calculations.	V1
3.2. 1.2	**Shall perform terrain masking for one or more ground based observers utilizing elevation data format as they apply.**	V1
3.2. 1.2.1	Observer height shall be considered.	V1
3.2. 1.2.2	Target height shall be considered.	V1
3.2. 1.2.3	The earth curvature shall be considered, with the curvature being modeled by selectable standard spheroids.	V1
3.2. 1.2.4	The terrain-shadowed (e.g. masked) areas shall be represented for any above ground altitude, including ground level.	V1
3.2. 1.2.5	Terrain masking can be constrained by:	V1
3.2. 1.2.5.1	Two or three-dimensional range.	V1
3.2. 1.2.5.2	Sectors of a circle.	V1
3.2. 1.2.5.3	Sectors of a sphere.	V1
3.2. 1.2.6	Shall permit accounting for atmospheric refraction effects.	V1
3.2. 1.2.7	The system shall provide the capability to filter the reduced resolution elevation data such that values such as the following are retrievable over a specified geographic area.	V1
3.2. 1.2.7.1	Maximum.	V1
3.2. 1.2.7.2	Minimum.	V1
3.2. 1.2.7.3	Average elevation values.	V1
3.2. 1.2.8	The system shall support both optical and electromagnetic LOS calculations. Frequencies to be supported for electromagnetic LOS are TBD	V1
3.2. 1.2.9	The system shall provide the capability for fast retrieval of DTED data in the systems that are not extremely powerful.	V1
3.2. 1.2.10	Set the range to be used to generate terrain masks.	V1
3.2. 1.2.10.1	Two-dimensional range.	V2
3.2. 1.2.10.2	Three-dimensional range.	V2
3.2. 1.2.11	Set the altitude to be used to cut and display a terrain mask.	V1
3.2. 1.2.12	Generate the Min/Max of a Feature.	V1
3.2. 1.2.13	Generate a Terrain Mask.	V1
3.2. 1.2.14	Use suitable NIMA products	V2
3.2. 1.2.15	Shall incorporate terrain elevation data into the masking calculations to determine the height above ground level (AGL) at which intervisibilty occurs for:	V2
3.2. 1.2.15.1	Aircraft/operational point	V2
3.2. 1.2.15.2	Aircraft/threat	V2
3.2. 1.2.15.3	Aircraft/assault zone	V2

3.2. 1.3	**Shall calculate point-to-point line-of-sight (LOS) utilizing elevation data retrieved from the Spatial Database Management System (SDBMS).**	V1
3.2. 1.3.1	Observer height shall be considered.	V1
3.2. 1.3.2	Target height shall be considered	V1
3.2. 1.3.3	Three dimensional range shall be considered.	V1
3.2. 1.3.4	Shall provide probability of detection isopleths based on the specified sensor or weapons systems assets and shall incorporate aircraft radar cross section if included in the application-specified.	V1
3.2. 1.3.5	Shall calculate an area that can be traversed by a moving target based on inputs of:	V1
3.2. 1.3.5.1	Elapsed time	V1
3.2. 1.3.5.2	Entity velocity	V1
3.2. 1.3.5.3	This area shall be included in LOS outputs for airborne and ground Targets.	V1
3.2. 1.3.6	Shall incorporate terrain masking to determine the altitude above ground level at which aircraft and Entity ground asset intervisibility occurs	V1
3.2. 1.3.7	The earth curvature shall be considered, with the curvature being modeled by selectable standard spheroids	V1
3.2. 1.3.8	Shall support both optical and electromagnetic LOS calculations, Frequencies to be supported for electromagnetic LOS are TBS. The effects and conditions to be considered are	V1
3.2. 1.3.8.1	Surface structures	V1
3.2. 1.3.8.2	Time-of-day	V1
3.2. 1.3.8.3	Elevation model accuracy	V1
3.2. 1.3.8.4	Atmospheric and tropospheric conditions shall be considered	V1
3.2. 1.3.9	Results of LOS calculation shall be prepared for output to application or for display.	V2
3.2. 1.3.9.1	The display of results shall occur either through paragraph (3.2.)2.20.4 or an application.	V2
3.2. 1.4	**Shall calculate vegetation effects on intervisibility utilizing obscuring features found in any of the NIMA feature data bases available.**	V1
3.2. 1.4.1	Obscuring features are:	V1
3.2. 1.4.1.1	Vegetation	V1
3.2. 1.4.1.2	Urban areas	V1
3.2. 1.4.1.3	Tactical obscurants (e.g. smoke, weather obscurants such as fog)	V1
3.2. 1.4.2	This capability shall augment any terrain masking or line-of-sight calculation.	V1
1.4.3	Calculations shall take into account selected feature attributes	V1
3.2. 1.4.3.1	Deciduous vs. conifer	V1
3.2. 1.4.3.2	Foliage height	V1
3.2. 1.4.3.3	Canopy closure	V1
3.2. 1.4.3.4	Season	V1
3.2. 1.4.4	Calculations shall take into account three operator entered structure attributes	V1
3.2. 1.4.4.1	Structure height	V1

3.2. 1.4.4.2	Structure width	V1
3.2. 1.4.4.3	Structure midpoint	V1
3.2. 1.4.5	Results shall be represented in at least three categories:	V1
3.2. 1.4.5.1	Definitely masks target	V1
3.2. 1.4.5.2	Definitely does not mask target	V1
3.2. 1.4.5.3	May have an effect on LOS	V1
3.2. 1.5	**Shall calculate distance by combining and utilizing**	V1
3.2. 1.5.1	Great circle technique	V1
3.2. 1.5.2	Rhumb line technique	V1
3.2. 1.5.3	Straight line technique	V1
3.2. 1.5.4	Technique used shall be application selectable or automatically provided depending on distance measurement desired.	V1
3.2. 1.5.4.1	If measurement includes a change in altitude the straight line technique would be used or great circle for common elevation.	V1
3.2. 1.5.5	Shall measure ground features or arbitrary ground paths for	V1
3.2. 1.5.5.1	Gridded products	V1
3.2. 1.5.5.2	Vector products	V1
3.2. 1.5.6	Cumulative distance calculation.	V2
3.2. 1.5.7	Provide slant range computation.	V2
3.2. 1.6	**Shall provide capability to automatically identify locations for threats and sensors which optimize the area visible to that Entity and sensor.**	V1
3.2. 1.6.1	Capability would only apply to areas found within either the threat or the sensor location error ellipses	V1
3.2. 1.6.2	Capability would utilize elevation data retrieved from the SDBMS.	V1
3.2. 1.6.3	Capability will be implemented so as to apply this function to selected threats and sensors.	V1
3.2. 1.6.4	The capability shall be provided to relocate the threat/sensor laterally (parallel to the surface), vertically, or both laterally and vertically.	V1
3.2. 1.7	**Shall provide sensor prediction capabilities which will predict, at moderate fidelity, the output of specific families of sensors to the detail of the data available.**	V1
3.2. 1.7.1	The sensor families featured will include	V1
3.2. 1.7.1.1	Real beam ground map radar	V1
3.2. 1.7.1.2	Pulse doppler radar	V1
3.2. 1.7.1.3	Synthetic aperture radar	V1
3.2. 1.7.1.4	Low light level television	V1
3.2. 1.7.1.5	Forward looking infrared (FLIR)	V1
3.2. 1.7.1.6	Targeting infrared.	V1
3.2. 1.7.1.7	Moderate fidelity seismic sensor model.	V2
3.2. 1.7.2	Predictions will be featured in the orientation that the real sensors are represented to the observer	V1
3.2. 1.7.3	The earth curvature shall be considered, with the curvature being modeled by selectable standard spheroids	V1
3.2. 1.7.4	The simulation will include	V1
3.2. 1.7.4.1	Radar simulation.	V1

3.2. 1.7.4.2	FLIR simulation.	V1
3.2. 1.7.4.3	Synthetic aperture radar (SAR) simulation.	V1
3.2. 1.7.5	Provide display to consider:	V2
3.2. 1.7.5.1	radar mode	V2
3.2. 1.7.5.2	range	V2
3.2. 1.7.5.3	aircraft orientation.	V2
3.2. 1.7.5.4	These must be inputs via an API.	V2
3.2. 1.8	**Shall provide the capability to generate a terrain profile from elevation data and vertical obstruction data provided by the application.**	V1
3.2. 1.8.1	Profile shall be calculated as	V1
3.2. 1.8.1.1	Straight line segment	V1
3.2. 1.8.1.2	Series of line segments	V1
3.2. 1.8.1.3	The data will be available as a linear feature from the spatial data base	V1
3.2. 1.8.2	Shall have capability to calculate LOS with the terrain profile	V1
3.2. 1.8.3	Start and end location for LOS calculations shall each have a selectable height	V1
3.2. 1.8.4	The earth curvature shall be considered in the calculation, with the curvature being modeled by selectable standard spheroids	V1
3.2. 1.8.5	Optionally, the profile view shall use as the elevation of the path the highest elevation within a application-specified distance to the right and left of the profile baseline path	V1
3.2. 1.8.6	Shall mark the locations of vertical obstructions available in the spatial database within a specified distance to the right and left of the profile baseline path.	V1
3.2. 1.8.7	Ice contour data	V2
3.2. 1.9	**Shall provide the capability to calculate and generate terrain perspective views utilizing. See paragraph (3.2.)2.20 for display function.**	V1
3.2. 1.9.1	Digital Terrain Elevation Data	V1
3.2. 1.9.2	Geocoded imagery	V1
3.2. 1.9.3	Any features available in the spatial data base, including overview information	V1
3.2. 1.9.4	Various ways to represent the terrain shall be available	V1
3.2. 1.9.4.1	Smooth	V1
3.2. 1.9.4.2	Faceted	V1
3.2. 1.9.4.3	Wire net	V1
3.2. 1.9.4.4	Shading can be arbitrary and may be simulating sun, moon, other source, or arbitrary placement of lighting.	V1
3.2. 1.9.4.5	Elevation contour banded	V1
3.2. 1.9.5	Perspective views may be generated from any observer position and orientation to a position of interest located at any height	V1
3.2. 1.9.6	The perspective angular field of view, depth of view and attitude (i.e. roll, pitch, yaw, etc.) of generation shall be totally selectable	V1
3.2. 1.9.7	The light source position shall be selectable by date and time or by arbitrary placement (azimuth and declination)	V1

3.2. 1.9.8	The earth horizon shall be factored into view generation	V1
3.2. 1.9.9	A representation of the desired route of the observer shall be included.	V1
3.2. 1.9.10	Shall include the capability to generate a perspective view, at any point along the path of locations.	V1
3.2. 1.9.11	Shall provide lighting effects of	V1
3.2. 1.9.11.1	Clear sky	V1
3.2. 1.9.11.2	Hazy sky	V1
3.2. 1.9.11.3	Overcast sky	V1
3.2. 1.9.11.4	Fog	V1
3.2. 1.9.11.5	Precipitation	V1
3.2. 1.9.12	View quality options of lighting effects and visibility attenuation shall, be calculated based on weather forecasts or historical weather conditions	V1
3.2. 1.9.13	Shall generate perspective views for	V1
3.2. 1.9.13.1	Visual prediction	V1
3.2. 1.9.13.2	Radar	V1
3.2. 1.9.13.3	Synthetic aperture radar prediction	V1
3.2. 1.9.14	Provide capability to register geographically referenced overlays (e.g. routes) onto a perspective view.	V2
3.2. 1.9.15	Must provide for display in a separate application-managed window or rendered into an application-provided pixmap.	V2
3.2. 1.9.16	Vertical exaggeration must be setable via an API.	V2
3.2. 1.10	**Shall provide a capability to calculate and generate perspective views of threat envelopes coupled with a terrain representation of the area involved in the scene. See paragraph (3.2.)2.46 for display.**	V1
3.2. 1.10.1	Envelopes shall vary in representation so as to portray the overlap of the threat envelopes for multiple sensors.	V1
3.2. 1.10.2	Envelopes shall be displayed with terrain and feature representations as output from the terrain perspective viewing function excluding the imagery overlay option.	V1
3.2. 1.10.3	Perspective views may be generated from any observer position and orientation to a position of interest located at any height.	V1
3.2. 1.10.3.1	This capability shall also include reversing the view and looking from the specific position of interest toward the observer.	
3.2. 1.10.4	Features highlighted in the perspective scene (including the target) that are terrain masked from the observer shall be represented as such.	V1
3.2. 1.10.5	The perspective angular field of view, depth of view and attitude (i.e.; roll, pitch, yaw) of generation shall be totally selectable	V1
3.2. 1.10.6	The light source (i.e. sun or moon) position shall be selectable by date and time or by arbitrary placement (azimuth and declination)	V1
3.2. 1.10.7	The earth horizon shall be factored into view generation	V1
3.2. 1.10.8	A representation of the desired route of the observer shall be included	V1
3.2. 1.10.9	The specific shape of the threat envelope shall be selectable by defining the sensor location, height, range, azimuth, inclination, and horizontal and vertical angular fields of view.	V1

3.2. 1.10.9.1	At a minimum, only the height and range of the sensor need be specified	V1
3.2. 1.10.10	The environment shall be calculated using a database of threat system characteristics.	V1
3.2. 1.10.10.1	Ground-based, airborne, and shipborne weapon systems, early warning and ground control intercept radar and small arms and armament shall be available.	V1
3.2. 1.10.11	Shall provide the capability to provide probability of detection isopleths (lines of equal probability) for specified threat systems and specific aircraft.	V1
3.2. 1.10.12	Interface shall be allowed to choose specified probabilities for which to display the isopleths.	V1
3.2. 1.10.13	Calculate the maximum detection range of a radar.	V1
3.2. 1.11	**Shall perform terrain feature categorization for a given area of interest (AOI) using selected terrain.**	V1
3.2. 1.11.1	Shall allow the selection by type and attribute of surface feature coverage and vertical obstructions. This includes	V1
3.2. 1.11.1.1	Vegetation	V1
3.2. 1.11.1.2	Soils	V1
3.2. 1.11.1.3	Transportation	V1
3.2. 1.11.1.4	Drainage	V1
3.2. 1.11.1.5	Slope	V1
3.2. 1.11.1.6	Industry	V1
3.2. 1.11.1.7	Obstacles	V1
3.2. 1.11.1.8	Generate the vector data for ridges and channels.	V1
3.2. 1.11.1.9	Calculate the magnetic compass declination for coordinate and date	V1
3.2. 1.11.1.10	Terrain views involving sea-land perspectives and ice edge data.	V2
3.2. 1.12	**Step-through analysis and viewing.**	V1
3.2. 1.12.1	Shall calculate a sequence of windows representing discrete views, for any perspective view type listed in paragraph 1.9, and any look angle and field of view.	V1
3.2. 1.12.2	Shall provide the capability to specify the starting and ending points.	V1
3.2. 1.12.2.1	Route fly-through	V1
3.2. 1.12.2.2	The number of window updates to be displayed along this route	V1
3.2. 1.12.2.3	Window updates shall correspond to equally-spaced changes in position of the viewpoint along the route between the starting and ending points of the fly-through.	V1
3.2. 1.12.2.4	Provide the views to be generated for a pre-defined route consisting of turn points which include aircraft orientation (roll pitch yaw).	V2
3.2. 1.12.3	Shall provide the fly-through sequence as to	V1
3.2. 1.12.3.1	Start	V1
3.2. 1.12.3.2	Stop	V1
3.2. 1.12.3.3	Pause	V1
3.2. 1.12.3.4	Restart	V1
3.2. 1.12.3.5	Reverse	V1
3.2. 1.12.3.6	Forward	V1
3.2. 1.12.3.7	Slow	V1

3.2. 1.12.3.8	Speed-up	V1
3.2. 1.12.3.9	Go to start	V1
3.2. 1.12.3.10	Go to end	V1
3.2. 1.12.3.11	Go to specified location	V1
3.2. 1.12.3.12	Go to specified time	V1
3.2. 1.13	**Shall have the capability to perform cross country movement (CCM) analysis using data retrieved from the SDBMS.**	V1
3.2. 1.13.1	Shall compute a maximum speed for a selected entity and given area of interest (AOI) based on	V1
3.2. 1.13.1.1	Slope	V1
3.2. 1.13.1.2	Vegetation	V1
3.2. 1.13.1.3	Soil	V1
3.2. 1.13.1.4	Surface roughness	V1
3.2. 1.13.1.5	Drainage features	V1
3.2. 1.13.1.6	Provide cross-water movement analysis as well to consider current tides and obstructions.	V2
3.2. 1.13.2	The analysis can be restricted to	V1
3.2. 1.13.2.1	On-road-only	V1
3.2. 1.13.2.2	Off-road-only	V1
3.2. 1.13.2.3	Mixed travel	V1
3.2. 1.13.3	Shall consider the effects of weather conditions	V1
3.2. 1.13.3.1	Precipitation over time	V1
3.2. 1.13.3.2	Fog	V1
3.2. 1.13.3.3	Temperature	V1
3.2. 1.13.4	The results shall be depicted as areas of go, slow-go, no-go and unevaluated for the selected vehicle type or aggregate of vehicles or other entities.	V1
3.2. 1.13.5	The reasons for no-go and slow-go shall be computed for each region (e.g. soil strength, slope, obstacle, braking)	V1
3.2. 1.13.6	Perform cross country movement on the specified surface material code (SMC) product.	V1
3.2. 1.13.7	Perform cross country movement on the specified cross country movement (CCM) information product.	V1
3.2. 1.13.8	Generate a path profile composed of a series of latitudes, longitudes, and altitudes at each point.	V1
3.2. 1.14	**Shall perform time-of-travel computations.**	V1
3.2. 1.14.1	Shall provide the capability to	V1
3.2. 1.14.1.1	Select a vehicle type	V1
3.2. 1.14.1.2	Define a vehicle type	V1
3.2. 1.14.1.3	Edit a vehicle type	V1
3.2. 1.14.2	Shall provide the capability to select time of travel computations according to a selected:	V1
3.2. 1.14.2.1	Vehicle type	V1
3.2. 1.14.2.2	Restriction to on-road-only	V1
3.2. 1.14.2.3	Restriction to off-road-only	V1
3.2. 1.14.2.4	Mixed travel	V1
3.2. 1.14.3	Time of travel prediction shall include the effects of known obstacles	V1

3.2. 1.14.4	Shall provide the capability to determine and display:	V1
3.2. 1.14.4.1	Total time of travel between specified start and end locations	V1
3.2. 1.14.4.2	Total and partial time of travel along a directed path broken into multiple specified segments.	V1
3.2. 1.14.5	Point-to-point features. (reference paragraph (3.2.)1.3 for additional detail)	V2
3.2. 1.14.6	Provide maritime movement.	V2
3.2. 1.15	**Shall provide the capability to select unit movement prediction analysis according to**	V1
3.2. 1.15.1	Unit echelon and composition	V1
3.2. 1.15.2	Restriction to on-road-only, off-road-only, or mixed travel.	V1
3.2. 1.15.3	Shortest path (straight-line) or fastest path between way-points, and time interval at which locations are reported	V1
3.2. 1.15.4	Unit movement prediction shall also include the effects of known obstacles.	V1
3.2. 1.15.5	Shall provide the capability to determine and display the predicted unit movement path between specified start and end locations along with time-stamped locations along the path.	V1
3.2. 1.15.6	Shall provide the capability to determine and display the total and partial predicted unit movements along a directed path which includes one or more specified way-points.	V1
3.2. 1.15.6.1	Time-stamped locations along the path shall also be displayed	V1
3.2. 1.15.7	An established route (with waypoints) and/or by deadreckoning capabilities	V2
3.2. 1.15.8	Information found in any appropriate data set including the MIDB.	V2
3.2. 1.16	**Shall calculate mobility corridors.**	V1
3.2. 1.16.1	Shall provide the capability to select a unit echelon and composition from a database of units.	V1
3.2. 1.16.2	Shall provide the capability to select weather conditions based on either historical patterns or current or projected measurements.	V1
3.2. 1.16.3	Shall provide the capability to determine cross-country movement potential (trafficability) within a specified geographic extent. Cross-country movement potential shall include the effects of:	V1
3.2. 1.16.3.1	Weather (including frozen rivers)	V1
3.2. 1.16.3.2	The selected unit echelon/composition (vehicles and/or dismounted combatants).	V1
3.2. 1.16.4	Shall provide the capability to define an analysis area based on a specified set of perimeter locations.	V1
3.2. 1.16.5	Shall provide the capability to determine and display mobility corridors within a specified analysis area according to a selected unit echelon/composition, previous cross-country movement potential analysis.	V1
3.2. 1.16.6	With information found in any appropriate data set including the MIDB.	V2
3.2. 1.17	**Shall support helicopter avenues of approach.**	V1
3.2. 1.17.1	Shall provide the capability to select a helicopter group configuration and composition from a database of helicopters.	V1

3.2. 1.17.2	Shall provide the capability to determine air movement potential within a specified geographic extent. Air movement potential shall include the effects of:	V1
3.2. 1.17.2.1	Weather	V1
3.2. 1.17.2.2	Specified lower air corridor altitude	V1
3.2. 1.17.2.3	Specified upper air corridor altitude	V1
3.2. 1.17.2.4	The selected helicopter group configuration and composition	V1
3.2. 1.17.3	Air movement potential shall also include the effects of vertical obstacles, terrain (e.g. mountains, canyons), and vegetation	V1
3.2. 1.18	**Shall provide the capability to calculate air mobility corridors within a specified analysis area according to a selected helicopter group configuration/ composition, and previous air movement potential analysis. See paragraph (3.2.)2.45 for display.**	V1
3.2. 1.19	**Shall have the capability to calculate and store the area gradient (i.e. slope), including direction in a particular area of interest from elevation data.**	V1
3.2. 1.19.1	Shall be able to specify ranges such that gradients within a specified tolerance.	V1
3.2. 1.20.	**Shall compute the point-to-point slope, including direction, between two given points, based on elevation data DTED.**	V1
3.2. 1.21	**Shall have the capability to calculate the ridge and valley lines in a particular area of interest from DTED.**	V1
3.2. 1.21.1	Shall be able to vary the thresholds employed in generating these features	V1
3.2. 1.21.1.1	Skeletonizing	V1
3.2. 1.21.1.2	Broadening	V1
3.2. 1.22	**Shall perform trafficability analysis along a specified route for lines of communication and transportation.**	V1
3.2. 1.22.1	Shall calculate time to travel a given route based on the impedance factors of surface materials, segment width and slope.	V1
3.2. 1.22.2	Collect options and determine the possible vehicle path.	V1
3.2. 1.22.3	Shall calculate all possible radial paths and distances traversed of a vehicle for a given period of time from a given start point.	V1
3.2. 1.22.4	Shall calculate all or specified number of shortest path through a road network given start and end points.	V1
3.2. 1.22.5	Shall calculate all or specified number of optimal path.	V1
3.2. 1.22.6	With information found in any appropriate data set including the MIDB.	V2
3.2. 1.23.	**Shall have the capability to calculate a heading between two geographic coordinates.**	V1
3.2. 1.23.1	Headings shall be calculated in either	V1
3.2. 1.23.1.1	True values	V1
3.2. 1.23.1.2	Magnetic values	V1
3.2. 1.23.2	Function shall comply with DoD tech. Note TN 8222-01-87	V1

3.2. 1.23.3	Both loxodrome and great circle bearing are required. Ellipsoidal equations are required not spherical.	V2
3.2. 1.23.4	Back azimuth of a great circle is also required.	V2
3.2. 1.23.5	Inverse solution is also required. Given a point, a bearing, and a distance calculate the point at the other end of the great circle or loxodrome.	V2
3.2. 1.24.	**Shall perform precise monoscopic positioning based upon.**	V1
3.2. 1.24.1	Imagery managed by the SDBMS	V1
3.2. 1.24.2	Calculate the accuracy of a position selected from image data.	V1
3.2. 1.24.3	Calculate the horizontal accuracy of a position.	V1
3.2. 1.24.4	Derive positional coordinates of selected points mensurated on.	V1
3.2. 1.24.5	Imported imagery products.	V1
3.2. 1.24.5.1	Standard ADRI	V1
3.2. 1.24.5.2	CMS-formatted ADRI	V1
3.2. 1.24.5.3	CIB imagery	V1
3.2. 1.24.6	Calculate absolute error of point positions at 90% circular error (CE).	V1
3.2. 1.24.6.1	Linear error (LE)	V1
3.2. 1.24.6.2	Spherical error (SE) from contributors:	V1
3.2. 1.24.6.2.1	Elevation Data	V1
3.2. 1.24.6.2.2	ADRI standard imagery	V1
3.2. 1.24.6.2.3	CMS-formatted ADRI imagery and CIB	V1
3.2. 1.24.6.2.4	Displayed scale	V1
3.2. 1.24.6.2.5	Cursor precision	V1
3.2. 1.24.6.2.6	Local geocoded imagery (if usable)	V1
3.2. 1.24.7	Associated datum.	V2
3.2. 1.25	**Shall provide the capability to store and retrieve the results of analytical calculations with a time date stamp such that they can be called back at a later time.**	V1
3.2. 1.26	**Shall determine aircraft to assault zone and aircraft to target intervisibility by calculating, the farthest points, at which line of sight (LOS) occurs**	V2
3.2. 1.26.1	LOS calculation shall be associated with each point from a users selected collection of points on the ground.	V2
3.2. 1.26.2	User shall be able to select from one point up to and including five points within the zone or target.	V2
3.2. 1.26.3	LOS shall be determined for all approach axes,	V2
3.2. 1.26.4	User shall be able to specify the altitude for aircraft.	V2
3.2. 1.27	**Shall (support the) display the DAFIF communication frequencies and navigation points available within a user-specified geographic area.**	V2
3.2. 1.28	**Shall calculate intervisibility and terrain masking for aircraft with ground based objects or AOIs.**	V2

3.2. 1.28.1	Shall provide an (application programming) interface (API) for an application to determine whether specific points on the ground are terrain-masked from an aircraft at a given altitude.	V2
3.2. 1.28.2	Shall provide an API for an application to obtain VPF vertical obstruction data for a specific AOI.	V2
3.2. 1.28.2.1	The data returned for each vertical obstruction consist of its Lat/Long, its vertical height, and a code indicating the type of vertical obstruction (i.e. FACC code).	V2
3.2. 1.28.3	Shall provide an API for an application to obtain elevation information for a specific AOI.	V2
3.2. 1.28.3.1	The data returned shall consist of a series of lat/long points and the height associated with each point.	V2
3.2. 1.28.4	Shall provide an API for an application to determine the elevation of a given point.	V2
3.2. 1.28.5	Shall provide an application programming interface (API) for an application to obtain the results of a calculation of the effects of terrain masking on intervisibility,	V2
3.2. 1.28.5.1	Intervisibility shall be between an aircraft and a fixed object on the ground and at a fixed height above the ground, such as an antenna.	V2
1.28.5.2	Shall incorporate terrain masking to determine the aircraft altitude AGL at which aircraft/threat intervisibility occurs.	V2
3.2. 1.28.6	Shall provide an application programming interface (API) which provides the capability to return the distance and bearing between WGS84 coordinates and the coordinates in a selected datum.	V2
3.2. 1.28.7	Shall provide an Application Programming Interface (API) to get objects by feature and get all features.	V2
3.2. 1.28.8	Shall provide an Application Programming Interface (API) to add multiple data attachments to create objects.	V2
3.2. 1.28.9	Shall provide an Application Programming Interface (API) to add application based raster objects.	V2
3.2. 1.29	**Shall provide the capability to perform, at request of an application program, comparisons of elevation data that result in the following products which can be passed to the application program:**	V2
3.2. 1.29.1	Target acquisition.	V2
3.2. 1.29.2	Multiple site target acquisition.	V2
3.2. 1.30	**For all application programming interfaces (APIs) which return coordinate data, JMTK shall provide options for formatting of the coordinate data.**	V2
3.2. 1.30.1	Options shall include latitude /longitude, UTM, MGRS, and GEOREF using all NIMA supported spheroids and datums.	V2
3.2. 1.30.2	Format options for latitude/longitude shall include degrees, minutes, and fractional minutes.	V2
3.2. 1.30.3	Precision options shall include 10ths, 100ths, or 1000ths of minutes.	V2

3.2. 2.0	**Display Functionality Requirements (Visual Domain)**	V1
3.2. 2.1	**Shall support selection of input and output units of measurement for all functions. See paragraph 1.1.2 for units of measure.**	V1
3.2. 2.2.	**Printer and Plotter Support**	V2
3.2. 2.2.1	Printer	V2
3.2. 2.2.1.1	Print map (screen).	V2
3.2. 2.2.1.2	Shall provide the capability to print maps, images, and charts.	V2
3.2. 2.2.1.2.1	The maps and charts shall be readable in the night vision goggles (NVG) environment to the same extent as a standard NIMA paper chart.	V2
3.2. 2.2.1.3	Shall provide the capability (to) display vector and raster maps and charts and print full color and black and white strip chart pages in flight-up and north-up orientation.	V2
3.2. 2.2.1.4	Strip maps, including a border of up to1/8 inch on each side, shall be selected from the following options, and shall be positioned to occupy the print area of the media size being utilized:	V2
3.2. 2.2.1.4.1	One per page, positioned on the right side (landscape view) with the left side free for print out of selectable products such as perspective view.	V2
3.2. 2.2.1.4.2	Two per page, positioned on the right and left (landscape view)	V2
3.2. 2.2.1.4.3	One per page (portrait view)	V2
3.2. 2.2.1.4.4	One per page (landscape view)	V2
3.2. 2.2.1.5	Shall provide the capability to adjust the horizontal, vertical, and rotational position of the strip chart page borders in relation to the displayed map background and in relation to overlays.	V2
3.2. 2.2.1.6	Shall provide the capability to print radar predictions, perspective and plan views of ADRI/CIB imagery and target imagery.	V2
3.2. 2.2.1.7	Shall provide the capability to add output of Hewlett Packard Graphics Language (HPGL) for plotting maps.	V2
3.2. 2.2.1.8	Shall support WGS-84 as the reference spheroid.	V2
3.2. 2.2.1.8.1	Shall allow the use of ADRG/CADRG as the internal reference projection.	V2
3.2. 2.2.1.8.2	Shall apply all necessary coordinate transformations to register input data which is geocoded in another coordinate system identified in DMA TM 8358.1 and/or DMA TR8350.2-B to the reference spheroid and projection.	V2
3.2. 2.2.2	Plotter Support.	V2
3.2. 2.2.2.1	Shall provide capability in support of plotting of tactical objects that are currently visible to the application user in the foreground of the Marine Air-Ground Task Force Command, Control, Communications, Computer, and Intelligence.	V2
3.2. 2.2.2.1.1	Shall provide support to a plotter capability that will plot tactical objects using an HP DraftPro Plus pen Plotter onto acetate transparencies. The acetate transparencies can then be placed on top of paper maps in tactical use by the Marine Corps.	V2

3.2. 2.2.2.1.2	Tactical Objects to be plotted will include symbols represented using MIL-STD-2525 and 2525A Symbology.	V2
3.2. 2.2.2.2	Symbols will include both the basic icon and amplifying text.	V2
3.2. 2.2.2.3	The support capability will support plotting of marine Corps grease-pencil overlays.	V2
3.2. 2.2.2.3.1	The objects will be plotted with the positions of symbols and the position and relative size of grease-pencil overlays properly registered to the paper map when the acetate transparency is placed upon it.	V2
3.2. 2.2.2.4	The initial plotter support capability will support registration to paper maps using the Mercator projection.	V2
3.2. 2.3	**Shall support and manage map windows and map layers.**	V1
3.2. 2.3.1	Shall provide support as to:	V1
3.2. 2.3.1.1	Create	V1
3.2. 2.3.1.1	Name	V1
3.2. 2.3.1.3	Delete	V1
3.2. 2.3.1.4	Hide	V1
3.2. 2.3.1.5	Expose	V1
3.2. 2.3.1.6	Draw	V1
3.2. 2.3.1.7	Refresh	V1
3.2. 2.3.1.7.1	The chart shall remain visible until the refresh display is ready for quick draw.	V1
3.2. 2.3.1.8	Recenter	V1
3.2. 2.3.1.8.1	Center On shall re-center the map on a selected track, pointer location, or the own ship position while maintaining the current radius.	V2
3.2. 2.3.1.8.2	Shall also allow the map to follow a selected track, keeping the selected track at center of the tactical display while moving the map as the track moves.	V2
3.2. 2.3.1.9	Catalog	V1
3.2. 2.3.1.10	Snapshot map windows.	V1
3.2. 2.3.1.10.1	Shall support the capability to create snapshots of display windows for use in other applications (for example, briefing tools).	V2
3.2. 2.3.2	Shall be able to select from a list of map windows according to their attributes or metadata.	V1
3.2. 2.3.3	For a map window, shall be able to set or reset the	V1
3.2. 2.3.3.1	Display scale	V1
3.2. 2.3.3.2	Map Projections. The system shall allow the chart to be displayed in the following map projection:	V1
3.2. 2.3.3.2.1	Albers Equal-Area Conic	V2
3.2. 2.3.3.2.2	Bonne	V2
3.2. 2.3.3.2.3	Cassini	V2
3.2. 2.3.3.2.4	Cylindrical Equal Area	V2
3.2. 2.3.3.2.5	Eckert IV	V2
3.2. 2.3.3.2.6	Eckert VI	V2
3.2. 2.3.3.2.7	Equidistant Cylindrical	V2
3.2. 2.3.3.2.8	Lambert Conformal Conic	V2
3.2. 2.3.3.2.9	Linear	V2
3.2. 2.3.3.2.10	Mercator	V2
3.2. 2.3.3.2.11	Miller Cylindrical	V2

3.2. 2.3.3.2.12	Mollweide	V2
3.2. 2.3.3.2.13	Orthographic	V2
3.2. 2.3.3.2.14	Polyconic	V2
3.2. 2.3.3.2.15	Sinusoidal	V2
3.2. 2.3.3.2.16	Transverse Cylindrical Equal Area	V2
3.2. 2.3.3.2.17	Transverse Mercator	V2
3.2. 2.3.3.2.18	Van Der Grinten	V2
3.2. 2.3.3.3	Window Size.	V1
3.2. 2.3.4	Shall support setting and run-time adjustment of the map window display cache size.	V1
3.2. 2.3.5	Shall be able to create a persistent representation of a map layer that can be	V1
3.2. 2.3.5.1	Stored	V1
3.2. 2.3.5.2	Retrieved	V1
3.2. 2.3.5.3	Interchanged.	V1
3.2. 2.3.6	Within a map window, shall provide support as to:	V1
3.2. 2.3.6.1	Insert map layers into a map window.	V1
3.2. 2.3.6.2	Remove map layers from a map window.	V1
3.2. 2.3.6.3	(Re)order map layers in a map window.	V1
3.2. 2.3.6.4	Update graphic depictions in a map layer for geographic data sets selected from the SDBMS, and using symbology selected from a symbology library.	V1
3.2. 2.3.7	Shall be able to insert or remove one or more map layers into another map layer by reference.	V1
3.2. 2.3.8	Shall support one background map layer in a map window.	V1
3.2. 2.3.8.1	Shall be able to designate one map layer as a background map layer for a map window. This map layer is not to be updated.	V1
3.2. 2.3.8.2	Shall be able to set the background map layer to be an application-supplied neutral-toned color.	V1
3.2. 2.3.9	Shall support registration of servers (which may be application-supplied) that can be invoked upon application request to draw specialized map layers.	V1
3.2. 2.3.10	Shall be able to translate between window coordinate and geocoordinate.	V1
3.2. 2.3.11	When an overlay is attached to a map view the map shall be recalled with the overlay.	V2
3.2. 2.3.12	The high-level widget of any window managed by JMTK must be available via an API.	V2
3.2. 2.3.13	Default Chart: Change the view of the tactical display to a default chart.	V2
3.2. 2.3.14	JMTK shall also be capable of rendering an application-supplied pixmap or drawable.	V2
3.2. 2.3.15	Set Default Chart: Allow the operator to define the default chart.	V2
3.2. 2.3.16	Previous Chart: Redisplay the chart shown just prior to the current map.	V2
3.2. 2.4	**Shall support and manage symbology libraries.**	V1
3.2. 2.4.1	Shall include the Common Warfighter Symbology library compliant with MIL-STD-2525 and 2525A	V1

3.2. 2.4.2	Shall include a default symbology library for each vector data product supported by the SDBMS	V1
3.2. 2.4.3	Shall support adding into a symbology library an association between a symbolization behavior and an SDBMS feature(s), and value or range of values for those attribute(s).	V1
3.2. 2.4.4	Other than the Common Warfighter Symbology library shall have the capability to	V1
3.2. 2.4.4.1	Create symbology libraries	V1
3.2. 2.4.4.2	Delete symbology libraries.	V1
3.2. 2.4.4.3	Modify symbology libraries.	V1
3.2. 2.4.5	Shall be able to retrieve a graphic object from a symbology library.	V1
3.2. 2.4.6	Shall be able to set and retrieve relative positions for annotations (text and otherwise) for a graphic object in a symbology library.	V1
3.2. 2.4.7	Shall support addition of symbology definitions and associated graphic expressions to the Common Warfighter Symbology library according to	V1
3.2. 2.4.7.1	MIL-STD 2525 and 2525A.	V1
3.2. 2.4.7.2	NTDS	V2
3.2. 2.4.7.3	LINK 11	V2
3.2. 2.4.8	Shall support additions and deletions of symbology definitions and associated graphic expressions to other libraries.	V1
3.2. 2.4.9	Shall support interchange of nonstandard symbols.	V1
3.2. 2.4.9.1	This means that if one application has a symbol that is not in the official MIL-STD 2525 or 2525A, but adheres to the encoding convention, then it should transmit a definition of it via an interchange mechanism.	V1
3.2. 2.4.10	Shall support filling the frame of a MIL-STD-2525 or 2525A - compliant symbol with	V1
3.2. 2.4.10.1	A specified color	V1
3.2. 2.4.10.2	For a specified region of the frame	V1
3.2. 2.4.10.3	With a pixmap which is clipped to the frame.	V1
3.2. 2.4.11	Provide an API to get the list of symbols sets supported the total number of symbol sets and the number of symbols in a given set.	V2
3.2. 2.5	**Shall support the display of a AOI reference map window associated with one or more other map windows.**	V1
3.2. 2.5.1	The AOI reference map window has a smaller display scale to include an entire AOI, and includes a footprint for each of the associated map windows.	V1
3.2. 2.5.2	Map layers can be added to the AOI reference map window.	V1
3.2. 2.6	**Shall support the maintenance of a subwindow (an inset) associated with a map window, which depicts the same contents as that map window at an application-specified magnification.**	V1
3.2. 2.6.1	The inset shall be an additional display window.	V2
3.2. 2.6.2	A menu system shall be provided for the inset that allows the operator to control the inset similarly to the display window.	V2
3.2. 2.7	**Shall support the display of selected metadata information about**	V1

3.2. 2.7.1	Data loaded	V1
3.2. 2.7.2	Data available in the SDBMS data dictionary	V1
3.2. 2.7.3	The SDBMS data dictionary	V1
3.2. 2.7.4	Data products produced by NIMA	V1
2.7.5	Available map layers	V1
3.2. 2.7.6	Available map products	V1
3.2. 2.7.6.1	Display a list of map products.	V2
3.2. 2.7.7	Analysis results	V1
3.2. 2.7.8	Data products for DIA include the Modernized Intelligence Database (MIDB).	V2
3.2. 2.8	**Shall support pan, zoom in and out, recentering, and home redisplay of the map window.**	V1
3.2. 2.8.1	Shall be able to pan smoothly or in jumps based on:	V1
3.2. 2.8.1.1	Screen distance	V1
3.2. 2.8.1.2	Geographic distance	V1
3.2. 2.8.1.3	Percentage of a map window in all directions	V1
3.2. 2.8.2	The AOI in which panning can be applied is application-defined or can be unconstrained.	V1
3.2. 2.8.3	Shall have the capability to move the center of a map window by	V1
3.2. 2.8.3.1	Placing the cursor at desired center point.	V1
3.2. 2.8.3.2	Inputting the desired coordinates.	V1
3.2. 2.8.4	Shall have the capability to resize a map window by placing the cursor at the desired center point or by inputting the desired center point coordinates along with the magnification and reduction factor	V1
3.2. 2.8.5	Shall have the capability to set specific scales from which to zoom	V1
3.2. 2.8.5.1	Shall specially handle integral zoom in or out of map layers that can be supported by pixel sampling or replication of raster data	V1
3.2. 2.8.6	Shall have a capability to resize the a map window by drawing a box around the area to be displayed via opposite corner input.	V1
3.2. 2.8.7	Shall have the capability to resize the a map window display around a specified center point and a given radius from that point	V1
3.2. 2.8.8	Shall support as a minimum three map insets (See requirement paragraph (3.2.)2.6).	V2
3.2. 2.8.9	Shall support a map monitor requirement (show world map relationship to current map (See (3.2.)2.6)).	V2
3.2. 2.8.10	Double Width: Double the radius of the current display maintaining the same center lat./lng.	V2
3.2. 2.8.11	Half Width: Halve the radius of the current display and maintaining the same center lat./lng.	V2
3.2. 2.8.12	Center/Width: Set the map to a given center and width.	V2
3.2. 2.8.13	Whole World: Expand the current view to show the whole world.	V2
3.2. 2.8.14	Shall have the capability to reset the projection and redisplay the map window.	V2
3.2. 2.9	**Shall provide capability to graphically display the availability of mapping data sets, their coverage and location, for all areas of the earth (polar and non-polar).**	V1

3.2. 2.9.1	The application shall have the capability to graphically display the contents of the on-line and off-line databases, using information from the NIMA digital catalog (MCS).	V1
3.2. 2.9.2	The display shall include the coverage and location of geographically referenced scanned material and other local geographically referenced data sets.	V1
3.2. 2.9.3	Coverage display should be color-coded by product type and should appear in a separate application-managed window or rendered in an application-provided pixmap.	V2
3.2. 2.9.4	The system shall allow an operator to print a list of maps in the database.	V2
3.2. 2.9.5	The coverage and location display shall be displayed as map coverage view draw boxes to mark the areas where maps exist.	V2
3.2. 2.9.6	The system shall allow operators to load a map from map cover view onto the display.	V2
3.2. 2.10.	**Shall have the capability to manipulate symbology in map layers.**	V1
3.2. 2.10.1	Graphic objects shall include	V1
3.2. 2.10.1.1	Polylines	V1
3.2. 2.10.1.2	Polymarkers	V1
3.2. 2.10.1.3	Circles	V1
3.2. 2.10.1.4	Arcs	V1
3.2. 2.10.1.5	Ellipses	V1
3.2. 2.10.1.6	Rectangles	V1
3.2. 2.10.1.7	Triangles	V1
3.2. 2.10.1.8	Polygons	V1
3.2. 2.10.1.9	Splines	V1
3.2. 2.10.1.10	Arrows (Axis of advance)	V1
3.2. 2.10.1.11	Text strings	V1
3.2. 2.10.1.12	Multiple line segment	V1
3.2. 2.10.1.13	Points	V2
3.2. 2.10.1.14	Draw primitives on the map temporarily without saving them as objects.	V2
3.2. 2.10.1.14.1	Mark primitives that are not to be saved.	V2
3.2. 2.10.1.15	Sectors	V2
3.2. 2.10.2	The use of symbol libraries shall be supported, and storage or retrieval of symbols in the libraries shall be allowed.	V1
3.2. 2.10.3	Shall support all of the symbols and operations on symbols specified in MIL-STD-2525 and 2525A [See also MIL-STD 2526.]	V1
3.2. 2.10.4	Shall support the creation of composite symbols that include multiple grouping of the symbols	V1
3.2. 2.10.5	Predefined and application-defined polygon fill patterns in a library shall be supported.	V1
3.2. 2.10.6	Arbitrary graphic object creation shall be supported through definition of polygon shape by an application-supplied or interactive drawing function.	V1
3.2. 2.10.6.1	Generate and display Elevation Contour Polygons.	V1
3.2. 2.10.6.2	Generate closed polygons for specified terrain elevations.	V1
3.2. 2.10.7	Symbol and map layer operations shall include interactive functions	V1

	such as move, resize, rotate, highlight, orient, etc. A symbol or map layer can be locked.	
3.2. 2.10.7.1	Move an object using the cursor.	V1
3.2. 2.10.7.2	Rotate the specified object utilizing the cursor.	V1
3.2. 2.10.7.3	Rescale the specified object utilizing the cursor.	V1
3.2. 2.10.7.4	Set the line style for the specified polyline primitive of the specified object.	V1
3.2. 2.10.7.5	Set the line style for the specified vector primitive of the specified object.	V1
3.2. 2.10.7.6	Set the width for the specified polyline primitive of the specified object.	V1
3.2. 2.10.7.7	Set the width for the specified vector primitive of the specified object.	V1
3.2. 2.10.7.8	Support the use of line patterns	V1
3.2. 2.10.7.9	Support the use of fill patterns and color selection of graphic objects	V1
3.2. 2.10.7.10	The application shall be able to position graphically an object by its	V1
3.2. 2.10.7.10.1	Center	V1
3.2. 2.10.7.10.2	Corner points	V1
3.2. 2.10.7.10.3	Anchor point	V1
3.2. 2.10.7.10.4	Geo-coordinate for its anchor point	V1
3.2. 2.10.7.10.5	Shall be able to designate the anchor position pixel (i.e., "hot spot") for which the graphic object will be positioned	V1
3.2. 2.10.7.11	In addition to the interactive mode an API is required for an application to perform the layer operations.	V2
3.2. 2.10.8	Shall support the grouping and ungrouping of graphic objects	V1
3.2. 2.10.8.1	Interactively allow picking of displayed feature or screen object.	V1
3.2. 2.10.8.1.1	Provide the capability to register special pick handler functions to be called when a particular type of object is picked.	V2
3.2. 2.10.8.1.2	Provide the ability to pick multiple objects by using the shift key or by picking all objects in a box circle or polygon defined by the cursor.	V2
3.2. 2.10.8.1.3	When multiple co-located objects are picked the toolkit should return a list of those objects so that the application can deconflict the pick.	V2
3.2. 2.10.8.2	Interactive selection of map and feature.	V1
3.2. 2.10.8.3	Interactively create and position an object.	V1
3.2. 2.10.8.4	Display the points as polygons in the main window.	V1
3.2. 2.10.8.5	Display the points as polylines in the main window.	V1
3.2. 2.10.8.6	Display the points as polymarkers in the main window.	V1
3.2. 2.10.8.7	Redraw the specified object if changed	V1
3.2. 2.10.8.8	Set the pick identifier for the current feature.	V1
3.2. 2.10.8.9	Set the current pick center.	V1
3.2. 2.10.8.10	Set the current pick radius.	V1
3.2. 2.10.8.11	Set the current value of the pick threshV1.	V1
3.2. 2.10.8.12	Shall support pick points on the screen and then display the distance between those points.	V1
3.2. 2.10.9	Shall have capability to create a text field which would either be associated with a symbol with a specified pixel offset or be another georeferenced symbol in a map layer	V1
3.2. 2.10.10	Text size, font, style, and orientation shall be application-specified.	V1
3.2. 2.10.10.1	Set the font for the specified marker primitive of the specified object.	V1
3.2. 2.10.10.2	Set the font for the specified polymarker primitive of the specified object.	V1
3.2. 2.10.10.3	Set the font for the named primitive.	V1

3.2. 2.10.10.4	Set the font for the specified text primitive of the specified object.	V1
3.2. 2.10.11	Shall be able to highlight a symbol or set of symbols by any of the following methods:	V1
3.2. 2.10.11.1	Brightness	V1
3.2. 2.10.11.2	Color	V1
3.2. 2.10.11.3	Outlining	V1
3.2. 2.10.11.4	Thickness enhancement	V1
3.2. 2.10.11.5	Blinking	V1
3.2. 2.10.12	Overlay Symbols Global Settings, reference [1] FM 101-5-1 [2] MIL-STD-2525 and 2525A	V2
3.2. 2.10.12.1	Display Symbology Selection	V2
3.2. 2.10.12.1.1	Icon Drawing Standards. The application shall be able to specify whether symbol are to be displayed according to [1] or according to [2].	V2
3.2. 2.10.12.1.2	When the specification is made, any displayed symbol not conforming to the selected specification shall be redrawn immediately, and, as new symbols are displayed, they shall be displayed according to the specification.	V2
3.2. 2.10.12.1.3	If a displayed symbol is not supported by the selected standard, it shall be erased from the display.	V2
3.2. 2.10.12.2	Monochrome or Polychrome Symbol Display. The application shall be able to specify whether symbol entities are to be displayed using the paradigms for monochrome or polychrome display when display is according to [1].	V2
3.2. 2.10.12.2.1	This need not conform with the characteristics of actual display hardware.	V2
3.2. 2.10.12.3	Color Assignment. The set of color names and the corresponding specifications for the display hardware shall be set before the start of JMTK.	V2
3.2. 2.10.12.3.1	It shall be possible to adjust both the color names used and the display specifications before starting a JMTK run.	V2
3.2. 2.10.12.3.2	It shall be a fatal error if the color name black is not in the list, and an unknown color shall be considered to be black.	V2
3.2. 2.10.13	Symbol Functionality	V2
3.2. 2.10.13.1	Creating Symbol. The functions in this section cause a new symbol to be created. At the time of creation, a symbol is given a unique identification (ID), which is defined until the symbol is destroyed.	V2
3.2. 2.10.13.1.1	Create symbol. The create symbol shall create a new symbol.	V2
3.2. 2.10.13.1.1.1	The application shall specify its attributes and the clause and overlay to which it shall be assigned.	V2
3.2. 2.10.13.1.1.2	The newly created symbol shall be ordered foremost within its clause.	V2
3.2. 2.10.13.1.2	Read symbol entity. The read symbol shall create a new symbol.	V2
3.2. 2.10.13.1.2.1	The intrinsic and spatial attributes of the symbol shall be read from permanent storage.	V2
3.2. 2.10.13.1.2.2	The application shall specify the visual attributes and clause and overlay to which the symbol belongs.	V2
3.2. 2.10.13.1.2.3	The newly created symbol shall be ordered foremost within its clause.	V2
3.2. 2.10.13.2	Selecting Symbols. The functions in this section all return a list of zero or more symbol IDs.	V2

3.2. 2.10.13.2.1	These lists can be passed to other functions for application of those functions to the symbols in the list.	V2
3.2. 2.10.13.2.2	The list shall be ordered compatibly with the ordering of symbols in clauses, clauses in overlays, and overlays.	V2
3.2. 2.10.13.2.3	The following functionality shall be provided for symbol ID lists:	V2
3.2. 2.10.13.2.3.1	The application shall be able to create empty symbol ID lists and add symbol IDs to existing lists.	V2
3.2. 2.10.13.2.3.2	The application shall be able to iterate over symbol ID lists, retrieving the symbol IDs in order.	V2
3.2. 2.10.13.2.3.3	The application shall be able to destroy symbol ID lists.	V2
3.2. 2.10.13.2.4	Select Picked Symbols. A function shall return the list of all picked symbols.	V2
3.2. 2.10.13.2.4.1	Select by Attribute Value. A function shall return the list of all symbols with a specified value for a specified attribute.	V2
3.2. 2.10.13.2.4.2	Selection by Real-World Coordinates. The function select by real-world coordinate shall return a list of the IDs of all symbols that are within an application-specified distance of an application-specified point.	V2
3.2. 2.10.13.2.4.3	Location shall correspond to a single point in a map image, and will be in the same system as the symbols in the display.	V2
3.2. 2.10.13.2.4.4	For the purpose of calculating the "real world" distance between two points, the distance along the great circle between to points shall be used.	V2
3.2. 2.10.13.2.4.4.1	The distance between a point and a linear symbol shall be the smallest distance between the point and any of the line segments defining the location of the symbol.	V2
3.2. 2.10.13.2.4.4.2	The distance between a point and an area shall be defined to be the distance between the point and the boundary of the area, with the distance to the boundary defined as though the boundary were a linear symbol.	V2
3.2. 2.10.13.2.5	Selection by Window Location. The function select by window location shall return a list of the IDs of all symbols within an application-specified distance (in pixels) of an application-specified position (in pixels).	V2
3.2. 2.10.13.2.5.1	Distance to a point-like symbol shall be the distance to the center of mass of the symbol icon.	V2
3.2. 2.10.13.3	Changing Symbol Attributes.	V2
3.2. 2.10.13.3.1	Edit Symbol. The edit symbol function shall take as input arguments a list of symbol IDs and a list of pairs of attributes and values.	V2
3.2. 2.10.13.3.1.1	Each symbol with its ID in the list shall have the specified attributes changed to the specified values.	V2
3.2. 2.10.13.3.1.2	The edit symbol function shall also allow the application to specify a new clause for all symbols in the list. (That is, one edit operation will either reassign no symbols, or reassign all of them to the same clause.)	V2
3.2. 2.10.13.3.1.3	When assigned to a new clause, a symbol goes to the top of the clauses ordered list. If a list is assigned to a single clause in the same operation, the ordering within the list is preserved.	V2
3.2. 2.10.13.3.2	Move Symbol. The move symbol function shall take as input arguments a list of symbol IDs and changes in latitude and longitude.	V2

3.2. 2.10.13.3.2.1	Each symbol with its ID in the list shall have all of its location values incremented by the specified changes.	V2
3.2. 2.10.13.3.2.2	This function shall not handle symbols with spatial attributes specified in pixels.	V2
3.2. 2.10.13.3.3	Edit Visual Attributes. Each of the visual attributes shall have a corresponding function that accepts a list of symbol IDs and a new value for the attribute.	V2
3.2. 2.10.13.3.3.1	It shall cause each of the symbols with its ID in the list to assume the new value for its attribute.	V2
3.2. 2.10.13.3.4	Reorder Symbols. The function reorder symbol shall accept a list of symbol IDs and a position. The symbols' IDs must correspond to symbols in a single clause.	V2
3.2. 2.10.13.3.4.1	The symbols with IDs in the list shall be placed, in list order, immediately below the specified position. (The position is determined before the symbols with IDs in the list are deleted from the IDs in the clause.)	V2
3.2. 2.10.13.4	Write Symbol. The write symbol function shall accept a list of symbol IDs.	V2
3.2. 2.10.13.4.1	It shall cause the symbol intrinsic and spatial attributes to be written to permanent storage for each symbol, in order.	V2
3.2. 2.10.13.4.1.1	The symbol shall be written so that it may be read by any implementation of JMTK on any machine.	V2
3.2. 2.10.13.5	Destroy Symbol. The destroy symbol function shall accept a list of symbol IDs.	V2
3.2. 2.10.13.5.1	It shall cause each of the symbols with IDs on the list to be destroyed, including deleting the symbols from their clauses and overlays.	V2
3.2. 2.10.13.5.1.1	Symbol below destroyed symbols in clauses shall move higher.	V2
3.2. 2.10.14	Creating Clauses. The functions in this section cause a new clause to be created.	V2
3.2. 2.10.14.1	Create clause. The create clause function shall create a new symbol within the application-specified overlay.	V2
3.2. 2.10.14.1.1	The newly created clause shall be empty.	V2
3.2. 2.10.14.1.1.1	The newly created clause shall be ordered foremost within its overlay.	V2
3.2. 2.10.14.1.2	Read clause. The read clause function shall create a new clause in the application-specified overlay.	V2
3.2. 2.10.14.1.2.1	The intrinsic and spatial attributes of the symbol in the clause shall be read from permanent storage.	V2
3.2. 2.10.14.1.2.2	The application shall specify the visual attributes of the symbol. The newly created clause shall be ordered foremost within its overlay.	V2
3.2. 2.10.14.2	Selecting Clauses. The functions in this section all return a list of zero or more clause IDs.	V2
3.2. 2.10.14.2.1	These lists can be passed to other functions for application of those functions to the clauses in the list.	V2
3.2. 2.10.14.2.2	The list shall be ordered compatibly with the ordering of clauses in overlays and overlays in displays/presentations.	V2
3.2. 2.10.14.2.3	The functionality provided for the list shall be analogous to that provided for symbol ID lists in (3.2.)2.10.14.2.2.	V2
3.2. 2.10.14.2.3.1	Selecting Picked Symbols. A function shall return the list of all clauses containing picked symbols.	V2

3.2. 2.10.14.2.3.2	Selecting by Attribute Value. A function shall return the list of all clauses containing symbols with a specified value for a specified attribute.	V2
3.2. 2.10.14.2.3.3	Selection by Real-World Coordinate of Symbols. The function select by real-world shall return a list of the IDs of all clauses containing symbols that are within an application-specified distance of an application-specified point.	V2
3.2. 2.10.14.2.3.3.1	Location shall correspond to a single point in a map image, and will be in the same system as the symbols in the display.	V2
3.2. 2.10.14.2.3.3.2	For the purpose of calculating the "real world" distance between two points, the distance along the great circle between two points shall be used.	V2
3.2. 2.10.14.2.3.4	Selection by Window Location Symbols. The function select by window location shall return a list of the IDs of all clauses containing symbols within an application-specified distance (in pixels) of an application-specified position (in pixels).	V2
3.2. 2.10.14.2.3.4.1	Distance to a point-like symbol shall be the distance to the center of mass of the symbol icon.	V2
3.2. 2.10.14.3	Changing Clause Characteristics.	V2
3.2. 2.10.14.3.1	Edit Clause. The edit clause function shall take as input arguments a list of clause IDs and a list of pairs of attributes and values.	V2
3.2. 2.10.14.3.1.1	Each symbol entity in a clause with its ID in the list shall have the specified attributes changed to the specified values.	V2
3.2. 2.10.14.3.1.2	The edit clause function shall also allow the application to specify a new clause for all clauses in the list, in which case the clauses in the list shall be merged into the specified clause.	V2
3.2. 2.10.14.3.1.3	The symbols shall be ordered in the new clause as they had been ordered before within and by clause.	V2
3.2. 2.10.14.3.2	Move Clause. The move symbol function shall take as input arguments a list of clause IDs and changes in latitude and longitude.	V2
3.2. 2.10.14.3.2.1	Each symbol in each clause with its ID in the list shall have all of its spatial attribute values incremented by the specified changes.	V2
3.2. 2.10.14.3.2.2	This function shall not handle symbols with location values specified in pixels.	V2
3.2. 2.10.14.3.3	Change Visual Attributes. Each of the visual attributes shall have a corresponding function that accepts a list of clause IDs and a new value for the attribute.	V2
3.2. 2.10.14.3.3.1	It shall cause each of the symbols in each clause with its ID in the list to assume the new value for its attribute.	V2
3.2. 2.10.14.3.4	Reorder Clause. The function reorder clause shall accept a list of clause IDs and a position. The clause IDs must correspond to clauses in a single overlay.	V2
3.2. 2.10.14.3.4.1	The clauses with IDs in the list shall be placed, in list order, below the specified position. (The position is determined before the clauses with IDs in the list are deleted from the IDs in the overlay.)	V2
3.2. 2.10.14.4	Storing Clauses. The only function providing for storing clauses is Write Clause.	V2
3.2. 2.10.14.4.1	Write Clause. The write clause function shall accept a list of clause IDs. It shall cause the symbol intrinsic and spatial attributes to be written to permanent storage for each symbol in each clause, in order.	V2

3.2. 2.10.14.4.1.1	Clause information shall be preserved so that it can be read by Read Clause (see (3.2.)5.3.1.2).	V2
3.2. 2.10.14.4.1.2	The written clause shall be readable by JMTK on any machine.	V2
3.2. 2.10.14.5	Destroying Clauses.	V2
3.2. 2.10.14.5.1	Destroy Clause. The destroy clause function shall accept a list of clause IDs.	V2
3.2. 2.10.14.5.1.1	It shall cause each of the clauses with IDs on the list to be destroyed, including destroying the symbols in the clause and deleting the clauses from their overlays.	V2
3.2. 2.10.14.5.1.2	Clauses below destroyed clauses in overlays shall take their places in the ordering.	V2
3.2. 2.10.15	Overlay Functionality.	V2
3.2. 2.10.15.1	Creating Overlays. The functions in this section cause a new overlay to be created. An overlay has a unique identification (ID) from creation to destruction.	V2
3.2. 2.10.15.1.1	Create overlay. The create overlay function shall create a new overlay.	V2
3.2. 2.10.15.1.1.1	The overlay shall be empty.	V2
3.2. 2.10.15.1.1.2	The newly created overlay shall be ordered first within its display/presentation.	V2
3.2. 2.10.15.1.2	Read overlay. The read overlay function shall create a new overlay.	V2
3.2. 2.10.15.1.2.1	The intrinsic and spatial attributes of the symbols within the overlay shall be read from permanent storage.	V2
3.2. 2.10.15.1.2.2	The application shall specify the visual attributes of the symbols, so that all will share the same visual attributes at creation.	V2
3.2. 2.10.15.1.2.3	The newly created overlay shall be ordered first within its map display.	V2
3.2. 2.10.15.2	Selecting Overlays. The functions in this section all return a list of zero or more overlay IDs.	V2
3.2. 2.10.15.2.1	These lists can be passed to other functions for application of those functions to the overlays in the list.	V2
3.2. 2.10.15.2.1.1	The list shall be ordered compatibly with the ordering of overlays in the map display.	V2
3.2. 2.10.15.2.1.2	The functionality provided for the overlay ID lists shall be analogous to that described in (3.2.)2.10.14.2.2.	V2
3.2. 2.10.15.2.2	Selecting Picked Symbols. A function shall return the list of all overlays containing picked symbols.	V2
3.2. 2.10.15.2.3	Selection by Attribute Value. A function shall return the list of all overlays with symbols having a specified value for a specified attribute.	V2
3.2. 2.10.15.2.4	Selection by Real-World Coordinate. The function select by real-world coordinate shall return a list of the IDs of all overlays containing symbols that are within an application-specified distance of an application-specified point.	V2
3.2. 2.10.15.2.4.1	The location system used and the definition of distance to a symbol shall be those defined in (3.2.)2.10.14.2.2.3.	V2
3.2. 2.10.15.2.5	Selection by Window Location. The function select by window location shall return a list of the IDs of all overlays containing symbols within an application-specified distance (in pixels) of an application-specified position (in pixels).	V2
3.2. 2.10.15.2.5.1	Distance shall be that defined in (3.2.)2.10.14.2.2.4.	V2

3.2. 2.10.15.3	Changing Overlay Characteristics.	V2
3.2. 2.10.15.3.1	Edit Overlay. The edit overlay function shall take as input arguments a list of overlay IDs and a list of pairs of attributes and values.	V2
3.2. 2.10.15.3.1.1	Each symbol in each overlay with its ID in the list shall have the specified attributes changed to the specified values.	V2
3.2. 2.10.15.3.1.2	This function can change clause assignments of any symbols.	V2
3.2. 2.10.15.3.2	Move Overlay. The move overlay function shall take as input arguments a list of overlay IDs and changes in latitude and longitude.	V2
3.2. 2.10.15.3.2.1	Each symbol in each overlay with its ID in the list shall have all of its spatial attribute values incremented by the specified changes.	V2
3.2. 2.10.15.3.2.2	This function shall not handle symbols with spatial values specified in pixels.	V2
3.2. 2.10.15.3.3	Change Visual Attributes. Each of the visual attributes shall have a corresponding function that accepts a list of overlay IDs and a new value for the attribute.	V2
3.2. 2.10.15.3.3.1	It shall cause each of the symbols in each overlay with its ID in the list to assume the new value for its attribute.	V2
3.2. 2.10.15.3.4	Reorder Overlay. The function reorder overlay shall accept a list of overlay IDs and a position.	V2
3.2. 2.10.15.3.4.1	The overlays with IDs in the list shall be placed, in list order, behind the specified position. (The position is determined before the overlays with IDs in the list are deleted from the list.)	V2
3.2. 2.10.15.4	Storing Overlays. The only function providing for storing overlays is Write Overlay.	V2
3.2. 2.10.15.4.1	Write Overlay. The write overlay function shall accept a list of overlay IDs.	V2
3.2. 2.10.15.4.1.1	The write overlay function shall accept a list of overlay IDs.	V2
3.2. 2.10.15.5	Destroying Overlays.	V2
3.2. 2.10.15.5.1	Destroy Overlay. The destroy overlay function shall accept a list of overlay IDs.	V2
3.2. 2.10.15.5.1.1	It shall cause each of the overlays with IDs on the list to be destroyed, including destroying the clauses (and hence the symbol) in the overlay.	V2
3.2. 2.10.15.5.1.2	Overlays below destroyed overlays shall take their places in the ordering.	V2
3.2. 2.10.16	For two or more overlay objects covering the same area of the tactical display the operator shall be able to specify the display priority.	V2
3.2. 2.11	**Shall have the capability to modify display; shift symbols or hide and unhide; activate and deactivate objects and features**	V1
3.2. 2.11.1	Shall be able to add and remove feature classes.	V1
3.2. 2.11.1.1	Features from a particular data source	V1
3.2. 2.11.1.2	Symbols or map layers.	V1
3.2. 2.11.1.3	Delete Sensor Allocation target/threat features.	V1
3.2. 2.11.1.4	Delete Sensor Allocation target visibility features.	V1
3.2. 2.11.1.5	Delete and erase all objects from the current feature.	V1
3.2. 2.11.1.6	Delete and erase the specified object from the current feature.	V1
3.2. 2.11.1.7	Delete all objects for the given feature.	V1
3.2. 2.11.1.8	Delete the terrain mask which is closest to the position given.	V1

3.2. 2.11.1.9	Delete the terrain mask specified by the segment identifier.	V1
3.2. 2.11.1.10	Delete all terrain masks generated and displayed.	V1
3.2. 2.11.2	Decluttering and undecluttering shall be	V1
3.2. 2.11.2.1	Keyed to particular scales	V1
3.2. 2.11.2.2	Keyed to specific areas to be displayed	V1
3.2. 2.11.2.3	Keyed by any combination of these techniques	V1
3.2. 2.11.2.4	Keyed by application-specified attributes	V1
3.2. 2.11.3	For VPF data types, the decluttering of the display shall allow applications to select each thematic layer of the data sets for display and non-display.	V1
3.2. 2.11.3.1	In addition, application shall have the capability to declutter based VPF primitives.	V2
3.2. 2.11.4	The system shall provide a function to spread out (move) symbol labels on a cluttered display	V2
3.2. 2.11.4.1	The symbols shall not be moved from their marking locations	V2
3.2. 2.11.4.2	A line shall be provided to connect the label and its symbol to ensure association by the operator	V2
3.2. 2.11.4.3	There shall be three modes	V2
3.2. 2.11.4.4	A dynamic mode which operates initially and subsequently automatically during updates	V2
3.2. 2.11.4.5	A freeze mode	V2
3.2. 2.11.4.6	An off mode which shall turn off the process	V2
3.2. 2.11.4.7	There shall be an entry into the title bar which announces that the freeze mode is turned on.	V2
3.2. 2.11.5	There shall be the capability to activate and deactivate objects and features by:	V2
3.2. 2.11.5.1	Date.	V2
3.2. 2.11.5.2	Time.	V2
3.2. 2.11.5.3	Selection of layer.	V2
3.2. 2.11.5.4	The operator shall be able to selectively activate and deactivate objects within an overlay.	V2
3.2. 2.11.5.5	The operator shall be able to selectively activate and deactivate feature classes.	V2
3.2. 2.12	**Shall have the capability to change the color of any object in a map layer (excluding imagery and raster maps)**	V1
3.2. 2.12.1	Change the map layer color.	V1
3.2. 2.12.2	Set the color for the object identifier.	V1
3.2. 2.12.3	Set the feature color for the track history of the specified object.	V1
3.2. 2.12.4	Set the track history visibility for the specified object.	V1
3.2. 2.12.5	Shall provide at least two selectable colors tables for graphic hardcopy output: one for normal viewing and one for use with night vision goggles.	V2
3.2. 2.12.6	Shall provide the capability for the major components of JMTK, as may be combined with any JMTK support components to provide the combinations of color and lighting conditions needed to support user operations.	V2
3.2. 2.12.6.1	Shall as a minimum support the following JMTK components; SDBM, Visualization (draw modules) and Analysis processes.	V2

3.2. 2.12.6.2	Shall combine with JMTK Support Applications, User Map Accessories, Mission Area Applications, other follow-on Automated Information Systems (AIS), and peripheral output devices.	V2
3.2. 2.12.6.3	Shall provide the capability for display of 256 colors, in addition to support for multiple color tables for the output of both hardcopy and digital products as a result of JMTK processes.	V2
3.2. 2.12.6.4	Shall provide the capability to assign colors to all symbology to permit optimization of conditions to met specific operational needs related to:	V2
3.2. 2.12.6.4.1	Brightness and contrast adjustments.	V2
3.2. 2.12.6.4.2	Use of sunglasses and high contrast visors.	V2
3.2. 2.12.6.4.3	Night vision goggles.	V2
3.2. 2.12.6.4.4	Operational platform lighting.	V2
3.2. 2.12.6.4.5	Continuity of color between products and between features and thematic overlays.	V2
3.2. 2.12.6.5	Shall employ algorithms and processes that do not cause any color degradation as a result of follow-on display, printing and copying, digitization, or data compression processes.	V2
3.2. 2.13	**Shall provide the capability to create, edit, and display legend and metadata information for symbols, map layers analysis results, and MCG&I data.**	V1
3.2. 2.13.1	Size, shape, content and format shall be definable	V1
3.2. 2.13.1.1	Display a legend of the coverage display features.	V1
3.2. 2.13.1.2	Display the Precise Monoscopic Positioning (PMP) error of an ADRI point.	V1
3.2. 2.13.1.3	Make the PMP legend no longer visible	V1
3.2. 2.13.1.4	Remove the Coverage legend from the display	V1
3.2. 2.13.1.5	Change the visibility for the ADRG legends indicated.	V1
3.2. 2.13.1.6	Set the visibility of the specified object.	V1
3.2. 2.13.1.7	Change the data for the specified polygon primitive of the specified object.	V1
3.2. 2.13.1.8	Change the style for the specified polygon primitive of the specified object.	V1
3.2. 2.13.1.9	Change the data for the specified polyline primitive of the specified object.	V1
3.2. 2.13.2	Contents shall include the accuracy and resolution information extracted from the original NIMA data header information for the specific data used in a particular display	V1
3.2. 2.13.3	Display the legend information associated with the ADRG maps for both the general class of maps and the chart specific information	V1
3.2. 2.13.4	Shall have the capability to display all attributes for all	V1
3.2. 2.13.4.1	Map date information	V1
3.2. 2.13.4.2	Accuracy information	V1
3.2. 2.13.4.3	Series information	V1
3.2. 2.13.4.4	Resolution information.	V1
3.2. 2.13.4.5	Shall have the capability to query a location over a map background window for such information as map date, accuracy, series, resolution.	V1
3.2. 2.13.4.6	Shall provide the capability to adjust brightness and contrast on background maps and images.	V2

3.2. 2.13.5	Shall provide the capability to extract information from the database concerning objects that are displayed and related specific information.	V1
3.2. 2.13.5.1	For example, if the database contains information about Communication links, then the application should display this as well.	V1
3.2. 2.13.6	Shall allow symbol objects to have associated labels that properly position based on width and height, or allow placement of labels to specify a relative pixel offset.	V2
3.2. 2.13.7	VPF Edit: Allow the operator to edit the features of a Vector Product Format (VPF) map.	V2
3.2. 2.14	**Shall have the capability to display grids for supported coordinate on any map display.**	V1
3.2. 2.14.1	Latitude and longitude	V1
3.2. 2.14.2	Gauss-Kruger, WAC/WAG	V1
3.2. 2.14.3	Sexagesimal coordinates.	V1
3.2. 2.14.4	Universal Transverse Mercator (UTM) grid	V1
3.2. 2.14.5	Military Grid Reference System (MGRS)	V1
3.2. 2.14.6	World Geographic Reference System (GEOREF) grid	V1
3.2. 2.14.7	Universal Polar Stereographic (UPS)	V2
3.2. 2.14.8	The operator shall be able to edit or delete existing gridded fields and to define new gridded fields.	V2
3.2. 2.14.9	When editing a gridded field the operator shall be able to view a window with a color-coded graphical display based on the database values defined for the gridded field.	V2
3.2. 2.14.10	Grid resolution should be application selectable. 1000 meter or less is minimum resolution required for MGRS ranging to 100.	V2
3.2. 2.15	**Shall have the capability to perform cursor-oriented queries on map.**	V1
3.2. 2.15.1	Shall generate and display the geocoordinate lat/long/elevation coordinate sets corresponding to the location of the cursor	V1
3.2. 2.15.1.1	Pick a point on the screen and then display its coordinates and associate accuracy (CE 90%, LE 90%) and datum of each coordinate.	V1
3.2. 2.15.1.2	Pick a point on the screen and display the elevation at that point.	V1
3.2. 2.15.1.3	Produce a display of the magnitude of an area's slope.	V1
3.2. 2.15.1.4	Display the angle between a picked line and either true or magnetic north.	V1
3.2. 2.15.1.5	Display the distance and bearing between interactively chosen points.	V1
3.2. 2.15.1.6	Interactively draw a polyline and display the distance and bearing.	V1
3.2. 2.15.2	Coordinate generation shall be a continuous operation or an "as-requested" operation	V1
3.2. 2.15.3	As with the positional coordinates, the ground elevation shall also be available to the application if there is elevation data underlying the requested position.	V1
3.2. 2.15.4	With all coordinates generated, an associated precision value for the placement of the cursor shall be produced based on displayed resolution of the map background (pixel size) and cursor sensitivity.	V1

3.2. 2.15.5	Shall create an associated accuracy value for all coordinates and elevations generated based on the data used for the position (including precision of cursor placement) or elevation derivation.	V1
3.2. 2.15.5.1	Shall display the accuracy of the current set of features on the map display.	V1
3.2. 2.15.5.2	Shall display the Coordinate Precision of a point.	V1
3.2. 2.15.6	Shall be able to pick any feature and display selected associated attributes this capability must extend to non-NIMA databases such as the MIDB as well as NIMA databases.	V1
3.2. 2.15.6.1	Allow to pick two points and display an intervisibility profile.	V1
3.2. 2.15.6.2	Allow the application to pick a path on the screen and display an intervisibility profile of the path.	V1
3.2. 2.15.6.3	Set the path coordinates to be used in the intervisibility functions.	V1
3.2. 2.15.6.4	Set the maximum range to be used in the intervisibility functions.	V1
3.2. 2.15.6.5	Shall be able to link an object within an overlay to database or other application information for the object.	V1
3.2. 2.15.6.5.1	For example, if a communication link is represented by a line between station locations, it should be possible to point-click on the line to view the information in the database.	V2
3.2. 2.15.6.6	Shall provide the capability to, at selectable altitudes AGL, display the outline areas where a direct line of sight exists with a defined point on or above the ground.	V2
3.2. 2.15.7	Shall be able to support cursor pick of any graphic symbol in a map layer and provide the associated object identifier to the application.	V1
3.2. 2.15.8	Shall provide the capability to display the cursor positions in WGS84 or any other coordinate system defined in DMA TM 8358.1 and /or DMA TR8350.2-B.	V2
3.2. 2.15.9	Provide the ability to register a function to be called while the cursor moves across the map.	V2
3.2. 2.15.10	Provide the ability to display a text string positioned near the cursor on the map. The text should move dynamically with the cursor. An API must allow the application to define the position of the text in relation to the cursor i.e. upper left	V2
3.2. 2.16	**Shall have the capability to perform pasteboard editing functions using pointing device.**	V1
3.2. 2.16.1	Annotate Pasteboard object.	V1
3.2. 2.16.2	Create a Pasteboard.	V1
3.2. 2.16.3	Cut an object.	V1
3.2. 2.16.4	Cut an object and Store in Clipboard.	V1
3.2. 2.16.5	Delete an object from the Clipboard.	V1
3.2. 2.16.7	Display a Pasteboard.	V1
3.2. 2.16.8	Delete the Contents of the Pasteboard	V1
3.2. 2.16.9	Paste an object onto the Pasteboard	V1
3.2. 2.16.10	Restore the Previous Pasteboard.	V1
3.2. 2.16.11	Use annotated object in Pasteboard.	V1
3.2. 2.17	**Shall be capable of displaying multiple separate and distinct map windows and insets simultaneously.**	V1

3.2. 2.17.1	The application shall have the capability of displaying a cursor in more than one map window simultaneously.	V1
3.2. 2.17.1.1	As an example, when map windows and insets have common areas of coverage, cursor movement in one display shall be reflected by a marker in the corresponding window(s) or inset(s).	V1
3.2. 2.17.1.2	The location of the cursor and markers shall be continuously displayed.	V2
3.2. 2.17.1.3	The operator shall be allowed to display the cursor position by any of the following measurements:	V2
3.2. 2.17.1.3.1	Latitude/longitude (lat/lng)	V2
3.2. 2.17.1.3.2	Military Grid Reference (MGR)	V2
3.2. 2.17.1.3.3	Universal Transverse Mercator (UTM)	V2
3.2. 2.17.2	Interactive functions shall take place in only one map window at a time	V1
3.2. 2.17.3	Redraw all visible maps in the display configuration.	V1
3.2. 2.17.4	Update the display to reflect changes made since the defer draw mode was set.	V1
3.2. 2.17.5	Redraw the map with the given scale.	V1
3.2. 2.17.6	Redraw the map with the given position at the center of the map display.	V1
3.2. 2.17.7	Change the area of the screen in which the current map is drawn.	V1
3.2. 2.17.8	Display the current map scale and the position of the map center.	V1
3.2. 2.17.9	Indicate the area of the world currently in view on the tactical display.	V2
3.2. 2.18	**Shall include the capability for absolute and relative symbol scaling**	V1
3.2. 2.18.1	Absolute symbol scaling shall provide the same size symbol no matter what zoom and rescaling function is initiated (symbol stays the same size).	V1
3.2. 2.18.2	Relative symbol scaling shall provide for the symbol to reflect the scale of the zoom and rescaling function (symbol gets larger and smaller).	V1
3.2. 2.19	**Shall support the display of digitized color maps**	V1
3.2. 2.19.1	Shall have capability to display raster map data containing multiple color tables. The application shall have the capability to selected any one of the color tables that are provided (e.g., CADRG contains 3 color tables).	V1
3.2. 2.19.2	Any map layer or vector feature may be superimposed on the map background.	V1
3.2. 2.19.3	Provide the capability for the application to provide a color map via an API.	V2
3.2. 2.19.4	Provide a database to save and retrieve map color combinations.	V2
3.2. 2.20.	**Shall provide the capability to display a terrain profile from elevation data selected from the SDBMS and vertical obstruction data provided in the SDBMS or provided by the application.**	V1
3.2. 2.20.1	Profile path shall represent a straight line segment, a series of line segments or a linear feature from the cartographic data base.	V1
3.2. 2.20.2	Profile display shall be labeled both vertically and horizontally.	V1

3.2. 2.20.3	Profile display shall have a application-selectable vertical exaggeration and horizontal scale.	V1
3.2. 2.20.4	Shall have capability to display LOS with the terrain profile.	V1
3.2. 2.20.5	The profile view shall display the surface of the earth as the highest elevation within a specified distance to the right and left of the profile baseline.	V1
3.2. 2.20.6	Shall mark vertical obstructions provided by the application or selected from the SDBMS within a specified distance to the right and left of the profile baseline.	V1
3.2. 2.21	**Shall provide the capability to display terrain perspective views utilizing elevation data, local geocoded and standard geocoded imagery and any of the features available in the data base.**	V1
3.2. 2.21.1	The features and representations are described in (3.2.)1.9.	V2
3.2. 2.21.2	Produce perspective views of terrain.	V1
3.2. 2.21.3	Produce a Radar Envelope in a perspective window.	V1
3.2. 2.21.4	Application can specify which map layers to drape in a perspective view.	V1
3.2. 2.21.5	Generate contour polylines for specified terrain elevations.	V1
3.2. 2.21.6	The system shall display Digital Terrain and Elevation Data (DTED) as a three-dimensional (3D) picture on the tactical display.	V2
3.2. 2.21.7	The display of the height of 3D information shall be color-coded.	V2
3.2. 2.22	**Shall display the results of surface analysis for a given AOI.**	V1
3.2. 2.22.1	Shall allow the display of surface feature coverage and vertical obstructions according to all thematic layers in the database.	V1
3.2. 2.22.2	This includes, but is not limited to, vegetation, soils, transportation, drainage, slope, industry, and obstacles.	V1
3.2. 2.22.3	Shall provide an interactive graphics interface and cataloging system to data bases.	V1
3.2. 2.23	**Shall provide displays supporting MCG&I data browsing function. See (3.2.)3.4 paragraph for MCG&I management functions.**	V1
3.2. 2.23.1	Show available on-line and off-line data bases	V1
3.2. 2.23.2	Choose desired input data bases.	V1
3.2.		
3.2. 2.24	**Each MCG&I display server shall provide support for multiple clients in the same window and for sharing of overlays among windows on separate client workstations.**	V1
3.2. 2.25	**Shall produce hardcopy of any map window or one or more map layers and overlays.**	V1
3.2. 2.25.1	Shall allow selection of a geographic region for hardcopy	V1
3.2. 2.25.1.1	Which is identical to the geographic extent visible within a map window	V1
3.2. 2.25.1.2	Which can be of any extent, regardless of visibility in a map window	V1
3.2. 2.25.2	Shall support CGM, Postscript, PCL, TIFF, NITFS, JPEG and HP GL	V1
3.2. 2.25.3	Shall support hardcopy to true scale (same scale as an associated paper map scale).	V1

3.2. 2.25.4	Shall support hardcopy to a specified or associated projection	V1
3.2. 2.25.5	Shall support the printing in north-up, track-up, and application other specified orientations	V1
3.2. 2.25.5.1	Provide strip charts functionality requires the capability to re-grid data to an application-specified orientation and extent.	V2
3.2. 2.25.5.2	Full annotation capability on these strip charts is required	V2
3.2. 2.25.6	Shall support multi-paged printouts in the case where the hardcopy size is smaller than the geographic region being hardcopied.	V1
3.2. 2.26	**Overlay Manager.**	V2
3.2. 2.26.1	Shall support the Army's FM-101 GOB unit symbols with embedded text fields and labels.	V2
3.2. 2.26.1.1	Shall allow a minimum of 230 symbols.	V2
3.2. 2.26.1.2	Shall provide the capability to change the colors of a symbols.	V2
3.2. 2.26.2	Shall allow scaling of overlay data to the scale of the background.	V2
3.2. 2.26.2.1	Shall provide the capability to overlay terrain delimitation products (such as GALE and IBIS) onto map displays.	V2
3.2. 2.26.3	Shall create terrain overlays for geocoded imagery backgrounds, which add depth and texture to typically "flat" imagery, in order to help the user gain an understanding of target vulnerability.	V2
3.2. 2.26.3.1	Shall provide the capability to label map symbols by location/facility name and type/name of major Order of Battle.	V2
3.2. 2.26.4	Country Colors. The system shall allow an operator to assign colors for countries that appear on the tactical display.	V2
3.2. 2.26.4.1	Colors may be turned on or off for any or all countries.	V2
3.2. 2.26.4.2	An operator shall be able to change the color of a particular country at any time from a list of choices.	V2
3.2. 2.26.4.3	When color values have been assigned for countries the system shall allow these values to be saved as the default values. If any country colors are changed the default values can be restored.	V2
3.2. 2.26.4.4	The system shall allow selection of countries by area to allow an operator to turn on or off colors for only those countries of interest from a particular geographical region.	V2
3.2. 2.26.4.5	The system shall allow an operator to print a list of countries and their on/off color state.	V2
3.2. 2.26.4.6	Country Colors. The system shall allow the operator to display country colors on the tactical display. The system shall allow the following items to be adjusted for country colors:	V2
3.2. 2.26.4.7	Label Visibility-whether the name of the country appears on the tactical display.	V2
3.2. 2.26.4.8	Font Size-the size of font used to display the name.	V2
3.2. 2.26.4.9	Line Style-the look of the country borders.	V2
3.2. 2.26.4.10	Line Width-the width (in pixels) of the country borders.	V2
3.2. 2.26.4.11	Borders/Line Visibility-whether the country border lines appear on the tactical display.	V2
3.2. 2.26.4.12	Fill. Type-the look of the fill type for the country colors.	V2
3.2. 2.26.4.13	For certain fill types the shade of the fill type can be adjusted.	V2
3.2. 2.26.4.14	Upper Width-the upper map width for this feature to be plotted on the tactical display.	V2

3.2. 2.26.5	Map Features. The system will allow an operator to control map features for Grid of lat./lng lines Countries Political Boundaries Contours Bottom Contours Rivers and Roads as described below.	V2
3.2. 2.26.5.1	The system shall allow the current feature settings to be saved and recalled.	V2
3.2. 2.26.5.2	The system shall allow an operator to print a list of the current feature settings.	V2
3.2. 2.26.6	Grid. The system shall allow the operator to display a grid of latitude and longitude lines on the tactical display. The system shall allow the following items to be adjusted for grids:	V2
3.2. 2.26.6.1	Font Size-whether the lat./lng values appear on the tactical display and the size of font used to display these values.	V2
3.2. 2.26.6.2	Line Style-the look of the grid lines.	V2
3.2. 2.26.6.3	Line Width-the width (in pixels) of the grid lines.	V2
3.2. 2.26.6.4	Borders/Lines-whether the grid appears on the tactical display.	V2
3.2. 2.26.6.5	Color-the color of the grid.	V2
3.2. 2.26.7	Political Boundaries. The system shall allow the operator to display political boundaries between countries. The system shall allow the following items to be adjusted for political boundaries:	V2
3.2. 2.26.7.1	Line Style-the look of the political boundaries.	V2
3.2. 2.26.7.2	Line Width-the width (in pixels) of the political boundaries.	V2
3.2. 2.26.7.3	Upper Width-the upper map width for this feature to be plotted on the tactical display.	V2
3.2. 2.26.7.4	Color-the color of the political boundaries.	V2
3.2. 2.26.8	Contour. The system shall allow the operator to display contour lines on the tactical display when DTED data is loaded. Contour lines are lines on the map that represent a constant altitude. The system shall allow the following items to be adjusted for	V2
3.2. 2.26.8.1	Units-the units used to display the altitude of the contour lines(meters or feet or fathoms).	V2
3.2. 2.26.8.2	Spacing-the spacing between adjacent contour lines.	V2
3.2. 2.26.8.3	Index Interval-the interval used to determine which contour lines are index lines.	V2
3.2. 2.26.8.4	Line Width: Index Width-the width (in pixels) of the contour and index lines.	V2
3.2. 2.26.8.5	Line Color: Index Color-the color of contour and index lines.	V2
3.2. 2.26.9	Bottom Contours. The system shall allow the operator to display bottom contours on the tactical display. The system shall allow the following items to be adjusted for bottom contours:	V2
3.2. 2.26.9.1	Line Style-the look of the lines used for bottom contours.	V2
3.2. 2.26.9.2	Line Width-the width (in pixels) of the bottom contours.	V2
3.2. 2.26.9.3	Upper Width-the upper map width for this feature to be plotted on the tactical display.	V2
3.2. 2.26.9.4	Color-the color of bottom contours.	V2
3.2. 2.26.10	Rivers and Road. The system shall allow the operator to display rivers and roads for areas of the world where river and road data is available. The system shall allow the following items to be adjusted for rivers and roads:	V2
3.2. 2.26.10.1	Line Style-the look of the rivers or roads.	V2
3.2. 2.26.10.2	Line Width-the width (in pixels) of the rivers or roads.	V2

3.2. 2.26.10.3	Upper Width-the upper map width for this feature to be plotted on the tactical display.	V2
3.2. 2.26.10.4	Color-the color of the rivers or roads.	V2
3.2. 2.26.11	The system shall allow the operator to input and maintain up to 500 overlays.	V2
3.2. 2.26.12	Each overlay shall be capable of having up to 100 objects and 256 total points.	V2
3.2. 2.27	**Shall display perspective views with:**	V2
3.2. 2.27.1	DTED Level 1	V2
3.2. 2.27.2	DTED Level 2	V2
3.2. 2.27.3	VPF feature analysis data	V2
3.2. 2.27.4	VPF vertical obstruction data	V2
3.2. 2.27.5	ADRI	V2
3.2. 2.27.6	CIB	V2
3.2. 2.27.7	Vector maps	V2
3.2. 2.27.8	Other operational imagery.	V2
3.2. 2.28	**Shall display these perspective views with the following options:**	V2
3.2. 2.28.1	Flat shading	V2
3.2. 2.28.2	Smooth shading	V2
3.2. 2.28.3	Diffuse lighting model	V2
3.2. 2.28.4	Visual prediction	V2
3.2. 2.28.5	Local viewer lighting model	V2
3.2. 2.28.6	Radar prediction (all effects)	V2
3.2. 2.28.7	Visibility attenuation	V2
3.2. 2.28.8	Anti-aliasing	V2
3.2. 2.29	**Shall display vertical profile views from DTED, VPF feature analysis data and VPF vertical obstruction data.**	V2
3.2. 2.29.1	The profile view shall be along a baseline between ordered an ordered sequence of two or more points, including those intrinsic to any arbitrary lineal feature such as a route.	V2
3.2. 2.29.2	The vertical profile view shall depict the height of the surface of the earth along the baseline.	V2
3.2. 2.29.3	The vertical profile view shall also be able to depict the surface of the earth at the highest elevation within a specific distance left or right of the baseline.	V2
3.2. 2.29.4	The vertical profile view shall provide selectable horizontal and vertical scale exaggeration.	V2
3.2. 2.29.5	Shall mark vertical obstructions from VPF features analysis data and VPF vertical obstruction data within a selectable distance to the right and left of the baseline.	V2
3.2. 2.30	**Shall provide an option to dim the background map and overlays while maintaining the brightness of selected overlays.**	V2
3.2. 2.30.1	Hypsographical features, derived from DTED, shall be represented using color value coding (i.e. light/dark) rather than hue coding (i.e. red, yellow, green, etc.).	V2

3.2. 2.30.2	Hypsographical features derived from DTED shall be represented as either an elevation value scale, or as a shade gradient value scale.	V2
3.2. 2.30.3	Provide an API to brighten and darken the raster background without affecting the overlays. Approximately 20 brightness steps should be provided.	V2
3.2. 2.30.4	Intensity: Brighten or darken the map currently displayed.	V2
3.2. 2.31	**Shall provide the capability for an application to select a feature(s) from a map by its type and geographic location according to the following rules:**	V2
3.2. 2.31.1	If one feature exists at a geographical location, then that feature is selected.	V2
3.2. 2.32	**Create, display, and delete sensor (Ground Based Sensor and Light and special Division Interim Sensor) terrain coverage overlays at various flight altitudes above ground level for field artillery/ air defense.**	V2
3.2. 2.32.1	Create implies the need to specify the parameters.	V2
3.2. 2.32.2	Shall provide support for a shot opportunity map overlay for a specific laydown of sensors and weapons for field artillery/ air defense.	V2
3.2. 2.32.3	Shall support the ability to display fire unit responsibility coverage zones for field artillery/ air defense.	V2
3.2. 2.32.4	Shall support the ability to generate a map background from multiple DMA (NIMA) ADRG CD ROM Media for field artillery/ air defense. The multiple media requirement implies the ability to generate a seamless map background from more than one CD ROM.	V2
3.2. 2.33	**Symbology Enhancements. Shall have full MIL-STD-2525 and 2525A compliance, the symbology capabilities will include the full complement of symbols as defined in the specification.**	V2
3.2. 2.33.1	The symbols will be composed in accordance with the specifications in paragraph 5.3 of MIL-STD-2525 and with MIL-STD 2525A.	V2
3.2. 2.33.2	Symbol frames, basic icons, modifiers and text, and the application display rules will be supported.	V2
3.2. 2.33.3	Lines, areas, obstacles, and fire support planning graphics shall be supported.	V2
3.2. 2.34	**Units Data Management and Display. Shall provide capability in support of units data management and display capability for operational users to manage a set of objects that will primarily support planning and execution of land-based operations.**	V2
3.2. 2.34.1	The capabilities shall meet the requirements generally associated with the management of databases.	V2
3.2. 2.34.2	The units managed with this database shall have attributes that support the display and will be displayed using MIL-STD-2525 and 2525A symbology within the common tactical picture of GCCS/JMCIS.	V2

3.2. 2.35	**Targets Data Management and Display. Shall provide capability in support of targets data management and display capability for operational users to manage a set of objects that will primarily support planning and execution of land-based operations.**	V2
3.2. 2.35.1	The capabilities shall meet the requirements generally associated with the management of databases.	V2
3.2. 2.35.2	The targets managed with this database shall have attributes that support the display and shall be displayed using MIL-STD-2525 and 2525A symbology within the common tactical picture of GCCS/JMCIS.	V2
3.2. 2.36	**Operations Management. Shall provide capability in support of data organizing concept called for in the SCP, the requirement exists for creation of a V2 object called an Operation.**	V2
3.2. 2.36.1	Users will be provided with the ability to group objects created under other capabilities within GCCS/JMCIS using the Operations construct.	V2
3.2. 2.36.2	Users will be provided with the ability to display these groupings directly.	V2
3.2. 2.37	**Future Enhancements. Shall provide for the following enhancements when available:**	V2
3.2. 2.37.1	Coordinate Precision. Shall support the reporting of coordinate precision for tracks and other data.	V2
3.2. 2.37.1.1	Maintain increased precision data reported on JUINT tracks.	V2
3.2. 2.37.1.2	Provide visibility into the actual reported precision of all data types.	V2
3.2. 2.37.1.3	Accuracy. Report position data in the coordinate system and datum native to the reporting device (e.g., Latitude/Longitude, UTM (MGRS), and GEOREF)	V2
3.2. 2.37.1.4	Enhanced Contact Report. Shall allow for flexibility in unit of measure and precision throughout all position reporting data elements (e.g., position, distance)	V2
3.2. 2.37.1.5	Shall provide the capability to report position data in the coordinate system and datum in relation to unit of measurement (distance) device native to the reporting device (e.g., Latitude/ Longitude, UTM(MGRS), and GEOREF).	V2
3.2. 2.37.2	Symbology Enhancements.	V2
3.2. 2.37.2.1	Ground Corridors. Shall include ground corridors (lanes) support in addition to the Air Corridor mentioned.	V2
3.2. 2.37.2.2	Area Of Interest/Area Of Responsibility. Shall include symbology support for AOI/AOR	V2
3.2. 2.37.3	Units Data Management and Display Enhancements.	V2
3.2. 2.37.3.1	Shall provide the capability to delete units locally and globally.	V2
3.2. 2.37.3.2	Shall include the capability to locally display tracks of a specific time delineation (age) by track type as well as prohibit the display of tracks by a specific time delineation and type.	V2
3.2. 2.37.3.3	Shall include declutter track display.	V2
3.2. 2.37.4	Targets data Management and Display Enhancements.	V2
3.2. 2.37.4.1	Shall include declutter target symbols display.	V2
3.2. 2.37.4.2	Shall include target correlation and capability to insure unique target ID assignment.	V2

3.2. 2.37.5	Operations Management Enhancements.	V2
3.2. 2.37.5.1	Shall include the capability to create subwindows of enlarged (zoomed) or panned windows.	V2
3.2. 2.38	**Display high resolution shoreline maps at a resolution of .06nm precision for world-wide coverage and .02nm for the United States.**	V2
3.2. 2.39	**Shall provide the capability to display the following entities over shoreline maps:**	V2
3.2. 2.39.1	Cities.	V2
3.2. 2.39.2	International maritime boundaries.	V2
3.2. 2.39.3	Exclusive economic zones.	V2
3.2. 2.39.4	National 12-mile coastal limits.	V2
3.2. 2.39.5	National 200-mile coastal limits.	V2
3.2. 2.39.6	Territorial seas boundaries.	V2
3.2. 2.39.7	Ocean areas.	V2
3.2. 2.39.8	Weather conditions.	V2
3.2. 2.39.9	User defined areas.	V2
3.2. 2.39.10	Shipping lanes.	V2
3.2. 2.39.11	Landmarks.	V2
3.2. 2.39.12	Airfields.	V2
3.2. 2.39.13	Airdrop locations.	V2
3.2. 2.39.14	Highways.	V2
3.2. 2.39.15	Railroads.	V2
3.2. 2.39.16	Ice edges.	V2
3.2. 2.39.17	Time zones.	V2
3.2. 2.39.18	Ocean contour (bottom) data.	V2
3.2. 2.40	**Shall provide the geographical display of tracks and their associated individual position movements (posits):**	V2
3.2. 2.40.1	Alphanumeric data pertaining to posits and tracks.	V2
3.2. 2.40.2	User defined annotations.	V2
3.2. 2.40.3	User defined lines of bearings (LOBS).	V2
3.2. 2.40.4	Calculation results overlaid onto the displayed map.	V2
3.2. 2.41	**3-D Visualizations and spherical projections of the earth.**	V2
3.2. 2.41.1	Correctly plot and display orbital platforms in relation and scale from the earth with a "GOD's EYE VIEW".	V2
3.2. 2.41.2	Support capabilities for distance and angular measurements between orbital platforms and points of the earth and be able to plot NADIR points and sensors coverage swaths for orbital platforms and their sensors.	V2
3.2. 2.41.3	Support the graphical display of the user-defined area of interest relative to the sensor coverage.	V2
3.2. 2.42	**Shall provide seamless retrieval and panning across raster product files.**	V2

3.2. 2.43	**Shall be interoperable with central raster product server.**	V2
3.2. 2.44	**The ability to populate to IDB entity attributes and to create IDB entity relationships from JMTK supported displays.**	V2
3.2. 2.44.1	Shall be able to interact with existing IDB SQL query, insert and delete statements via application program interface.	V2
3.2. 2.45.	**Shall provide the capability to display air mobility corridors within a specified analysis area according to a selected helicopter group configuration/ composition, and previous air movement potential analysis. (See paragraph (3.2.)1.18.)**	V1
3.2. 2.46.	**Shall provide a capability to display perspective views of threat envelopes coupled with a terrain representation of the area involved in the scene. (See paragraph (3.2.)1.10.)**	V1
3.2. 2.46.1	Envelopes shall vary in representation so as to portray the overlap of the threat envelopes for multiple sensors.	V1
3.2. 2.46.2	Envelopes shall be displayed with terrain and feature representations as output from the terrain perspective viewing function excluding the imagery overlay option.	V1
3.2. 2.46.3	Perspective views may be generated from any observer position and orientation to a position of interest located at any height.	V1
3.2. 2.46.3.1	This capability shall also include reversing the view and looking from the specific position of interest toward the observer.	V1
3.2. 2.46.4	Features highlighted in the perspective scene (including the target) that are terrain masked from the observer shall be represented as such.	V1
3.2. 2.46.5	The perspective angular field of view, depth of view and attitude (i.e.; roll, pitch, yaw) of generation shall be totally selectable	V1
3.2. 2.46.6	The light source (i.e. sun or moon) position shall be selectable by date and time or by arbitrary placement (azimuth and declination)	V1
3.2. 2.46.7	The earth horizon shall be factored into view generation	V1
3.2. 2.46.8	A representation of the desired route of the observer shall be included	V1
3.2. 2.46.9	The specific shape of the threat envelope shall be selectable by defining the sensor location, height, range, azimuth, inclination, and horizontal and vertical angular fields of view.	V1
3.2. 2.46.9.1	At a minimum, only the height and range of the sensor need be specified	V1
3.2. 2.46.10	The environment shall be calculated using a database of threat system characteristics.	V1
3.2. 2.46.10.1	Ground-based, airborne, and shipborne weapon systems, early warning and ground control intercept radar and small arms and armament shall be available.	V1
3.2. 2.46.11	Interface shall be allowed to choose specified probabilities for which to display the isopleths.	V1
3.2. 2.47.	**Shall have the capability to combine raster, gridded, and vector data to form a single raster result.**	V1

3.2. 2.47.1	Both elevation tinted (color contour banding) and elevation shaded (light source relief shading) representations may be fused into a composite image (relief shaded elevation contour banded image).	V1
3.2. 2.47.2	Shall support update of raster maps and charts with vector and image data.	V1
3.2. 2.47.3	Shall support augmentation of imagery with vector data.	V1
3.2. 2.47.4	Calculate the color histogram of the designated image area.	V1
3.2. 2.47.5	Shall be able to logically link this information to attribute records found in the MIDB or in other geospacial data sets.	V2
3.2. 2.48.	**Shall support Digital Nautical Chart and System Electronic Navigational Chart.**	V2
3.2. 2.48.1.	Shall provide the capability to access and review the contents of transportable electronic media containing the Digital Nautical Chart (DNC).	V2
3.2. 2.48.1.1	Information retrieved for review shall include:	V2
3.2. 2.48.1.2	DNC title	V2
3.2. 2.48.1.3	DNC number	V2
3.2. 2.48.1.4	DNC edition	V2
3.2. 2.48.1.5	DNC edition date	V2
3.2. 2.48.1.6	DNC area of coverage	V2
3.2. 2.48.1.7	Each DNC shall be stored separate from other DNCs, and separate from all other chart products, updates, and overlays.	V2
3.2. 2.48.2.	Shall provide the capability to copy the DNC to hard disk to generate the System Electronic Navigational Chart (SENC) which shall be comprised of:	V2
3.2. 2.48.2.1	The DNC	V2
3.2. 2.48.2.2	Official updates to the DNC	V2
3.2. 2.48.2.3	Operator entered (unofficial) updates to the DNC including Notice to Mariners	V2
3.2. 2.48.2.4	Operator entered overlay information	V2
3.2. 2.48.2.5	The generation of the SENC does not imply real-time processing of NIMA supplied DNC data, rather it allows for one-time processing of the SENC data when first loading a DNC.	V2
3.2. 2.48.2.6	All data files and link files necessary to associate the DNC, updates and overlays shall be stored to hard disk.	V2
3.2. 2.48.3.	Shall provide the capability to access and review the contents of the SENC on the hard disk. Information retrieved for review shall include:	V2
3.2. 2.48.3.1	SENC title	V2
3.2. 2.48.3.2	SENC number	V2
3.2. 2.48.3.3	SENC date	V2
3.2. 2.48.3.4	SENC area of coverage	V2
3.2. 2.48.3.5	DNC edition	V2
3.2. 2.48.3.6	DNC edition date	V2
3.2. 2.48.3.7	DNC updates applied (by date)	V2
3.2. 2.48.3.8	Overlays added (by date)	V2
3.2. 2.48.4.	Shall display the SENC (DNC and all updates to it) without any degradation of information content.	V2
3.2. 2.48.5.	Shall provide SENC OBJECT CLASS CODES specified in IHO S-57.	V2

3.2. 2.48.5.1	Shall provide the capability to automatically associate VPF features contained in the DNC (specified in MIL-D-89023) and information contained in overlays to the DNC (which when combined with the DNC comprise the SENC) using the SENC.	V2
3.2. 2.48.6.	**OBJECT CLASS CODES.**	V2
3.2. 2.48.6.1	Shall provide a color palette containing the SENC COLOR TOKENS specified in Table 3 of Appendix 2 to IHO S-52.	V2
3.2. 2.48.6.1.1	Shall provide the capability to automatically display VPF features contained in the DNC (specified in MIL-D-89023) and information contained in overlays to the DNC (which when combined with the DNC comprise the SENC) using the SENC COLOR TOKENS.	V2
3.2. 2.48.6.2.	Shall provide a symbol set containing the SENC PRESENTATION LIBRARY symbols according to Annex A of Appendix 2 to IHO S-52.	V2
3.2. 2.48.6.2.1	Shall provide the capability to automatically display VPF features contained in the DNC (specified in MIL-D-89023) and information contained in overlays to the DNC (which when combined with the DNC comprise the SENC) using the SENC PRESENTATION LIBRARY.	V2
3.2. 2.48.6.3.	Shall provide a font set containing the fonts specified in Appendix 2 to IHO S-52.	V2
3.2. 2.48.6.3.1	Shall provide the capability to automatically display VPF information contained in the DNC (specified in MIL-D-89023) and additional information contained in overlays to the DNC (which when combined with the DNC comprise the SENC) using these fonts.	V2
3.2. 2.48.7.	Electronic Chart Display Information System (ECDIS) COLOR TABLES	V2
3.2. 2.48.7.1	Shall provide 6 ECDIS COLOR TABLES using the SENC COLOR TOKENS specified in Annex A of Appendix 2 to IHO S-52 as follows:	V2
3.2. 2.48.7.1.1	Bright Sun	V2
3.2. 2.48.7.1.2	Day – White background	V2
3.2. 2.48.7.1.3	Day – Black Background	V2
3.2. 2.48.7.1.4	Dusk	V2
3.2. 2.48.7.1.5	Night – For Use With Filter	V2
3.2. 2.48.7.1.6	Night – No Filter	V2
3.2. 2.48.7.2	The default ECDIS COLOR TABLES may be prepared using the sample data for a "typical" monitor in Annex B of appendix 2 to IHO S-52.	V2
3.2. 2.48.7.3	However, the ECDIS COLOR TABLES shall be modifiable to allow for specific monitors contained in system configurations.	V2
3.2. 2.48.8.	Shall provide the following minimum information layers (each of which may be divided into numerous layers) to establish the priority of data on the display according to paragraph 5.3 of IHO S-52 and paragraph 2.3.2 of Appendix 2 to IHO S-52:	V2
3.2. 2.48.8.1	(1) Visual Alarms and /or indications (e.g. caution, overscale)	V2
3.2. 2.48.8.2	(2) DNC data: points, lines, and areas (including official updates to the DNC)	V2
3.2. 2.48.8.3	(3) Unofficial updates including operator entered Notice to Mariners and Radio Navigation Warnings	V2
3.2. 2.48.8.4	(4) DNC cautions	V2
3.2. 2.48.8.5	(5) DNC color-fill area data	V2

3.2. 2.48.8.6	(6) DNC on demand data	V2
3.2. 2.48.8.7	(7) Radar information (When present, the radar data is always written over the eight opaque area fills listed in paragraph 3.1.2 of IHO S-52.)	V2
3.2. 2.48.8.8	(8) Operator entered data: Overlay points, lines, and areas	V2
3.2. 2.48.8.9	(9) JMTK data: bearing/range TDA, etc.	V2
3.2. 2.48.8.10	(10) Operator entered color fill area data	V2
3.2. 2.48.8.11	Note: The information categories as mentioned above are in order of priority, i.e. category "n+1" should not obscure information of category "n" or any category above "n".	V2
3.2. 2.48.9.	Shall provide a default profile that automatically allocates VPF features contained in the DNC (specified in MIL-D-89023) and additional information contained in overlays to the DNC (which when combined with the DNC comprise the SENC) to IMO.	V2
3.2. 2.48.9.1	International Maritime Organization (IMO) display categories shall be according to Appendix 2 to IMO Resolution A.817(19) and Table 4 of Appendix 2 to IHO S-52 as follows:	V2
3.2. 2.48.9.1.1	DISPLAY BASE	V2
3.2. 2.48.9.1.1.1	“The level of SENC information which can not be removed from the display, consisting of information which is required at all times in all geographic areas and all circumstances. It is not intended to be sufficient for safe navigation.”	V2
3.2. 2.48.9.1.1.2	The DISPLAY BASE consists of:	V2
3.2. 2.48.9.1.1.2.1	coastline (high water)	V2
3.2. 2.48.9.1.1.2.2	own ship’s SAFETY CONTOUR	V2
3.2. 2.48.9.1.1.2.3	indication of isolated underwater dangers of depths less than the SAFETY CONTOUR which lie within the safe waters defined by the SAFETY CONTOUR	V2
3.2. 2.48.9.1.1.2.4	indication of isolated dangers which lie within the safe water defined by the SAFETY CONTOUR such as bridges, overhead wires, etc., and including buoys and beacons, whether or not these are being used as aids to navigation	V2
3.2. 2.48.9.1.1.2.5	traffic routing systems	V2
3.2. 2.48.9.1.1.2.6	scale, range, orientation and display mode	V2
3.2. 2.48.9.1.1.2.7	units of depth and height	V2
3.2. 2.48.9.1.2	STANDARD DISPLAY	V2
3.2. 2.48.9.1.2.1	“The SENC information that should be shown when a chart is first displayed on the ECDIS and depending upon the needs of the mariner, the level of the information it provides for route planning or route monitoring may be modified by the mariner.”	V2
3.2. 2.48.9.1.2.2	The STANDARD DISPLAY consists of:	V2
3.2. 2.48.9.1.2.2.1	display base	V2
3.2. 2.48.9.1.2.2.2	drying line	V2
3.2. 2.48.9.1.2.2.3	indication of fixed and floating aids to navigation	V2
3.2. 2.48.9.1.2.2.4	boundaries of fairways, channels, etc.	V2
3.2. 2.48.9.1.2.2.5	visual and radar conspicuous features	V2
3.2. 2.48.9.1.2.2.6	prohibited and restricted areas	V2
3.2. 2.48.9.1.2.2.7	chart scale boundaries	V2
3.2. 2.48.9.1.2.2.8	indication of cautionary notes	V2
3.2. 2.48.9.1.3	OTHER INFORMATION	V2

3.2. 2.48.9.1.3.1	"Chart information not contained in the STANDARD DISPLAY, displayed only on demand."	V2
3.2. 2.48.9.1.3.2	OTHER INFORMATION includes for example:	V2
3.2. 2.48.9.1.3.2.1	spot soundings	V2
3.2. 2.48.9.1.3.2.2	submarine cables and pipelines	V2
3.2. 2.48.9.1.3.2.3	ferry routes	V2
3.2. 2.48.9.1.3.2.4	details of isolated dangers	V2
3.2. 2.48.9.1.3.2.5	details of aids to navigation	V2
3.2. 2.48.9.1.3.2.6	contents of cautionary notes	V2
3.2. 2.48.9.1.3.2.7	ENC edition date	V2
3.2. 2.48.9.1.3.2.8	geodetic datum	V2
3.2. 2.48.9.1.3.2.9	magnetic variation	V2
3.2. 2.48.9.1.3.2.10	graticule	V2
3.2. 2.48.9.1.3.2.11	place names	V2
3.2. 2.48.9.2	The detailed allocation of SENC OBJECT CLASSES to these display categories is listed in Table IV of S-52, Appendix 2.	V2
3.2. 2.48.10.	Shall provide the capability within the default profile to automatically display the SENC in the STANDARD DISPLAY, at the largest scale available for the displayed area.	V2
3.2. 2.48.11.	Shall provide the capability to switch to the BASE DISPLAY and STANDARD DISPLAY at any time by single operator action.	V2
3.2. 2.48.11.1	A single operator action may be achieved by activating a hardkey or softkey, including any necessary cursor movement.	V2
3.2. 2.48.12.	Shall provide the capability to add or remove information from the display.	V2
3.2. 2.48.12.1	It shall not be possible to remove information contained in the Display Base.	V2
3.2. 2.48.12.2	The addition or deletion of information shall be limited to categories of information, for example prohibited and restricted areas, spot soundings, not individual items, for example, an individual area or an individual sounding.	V2
3.2. 2.48.12.3	The number of single operator actions shall not be more than three.	V2
3.2. 2.48.13.	DNC and SENC Performance.	V2
3.2. 2.48.13.1	Shall provide the capability to redraw the chart to follow ownship's progress, including scale changes due to change in scale of the chart information, shall take less than 5 seconds.	V2
3.2. 2.48.13.2	Demands by the operator that cannot be predicted, such as draw at a different scale or in a different area may take more than 5 seconds.	V2
3.2. 2.48.13.3	In the latter case the operator shall be informed and the existing display shall continue unaffected until the information is ready to be redrawn within 5 seconds.	V2
3.2. 2.48.14.	Shall use the official NIMA guidance for conversion of local datums to WGS-84.	V2
3.2. 2.48.15.	Shall use WGS-84 as the horizontal datum for common reference in accordance with IHO Technical Resolution B1.1.	V2
3.2. 2.48.16.	Shall provide an indication if WGS-84 is not used as the common reference system.	V2
3.2. 2.48.17.	Shall provide a true motion mode.	V2

3.2. 2.48.17.1	When true motion mode is in use, reset and generation of the neighboring area shall take place automatically at a distance from the border of the display determined by the mariner.	V2
3.2. 2.48.18.	Shall provide the capability to adjust the length of ALL vectors displayed within a chart window to represent the distance traveled over an operator specified period of time.	V2
3.2. 2.48.19.	Shall provide the capability to access the description and associated attributes of a SENC object for processing or display resulting from an operator's cursor (spatial) query.	V2
3.2. 2.48.19.1	This capability must be implemented to return the description and attributes to the responsible Mission Application (segment), not just to a display.	V2
3.2. 2.48.20.	Shall provide the capability for a segment process and/or operator to select a SAFETY CONTOUR from the depth contours provided by the DNC (within the SENC).	V2
3.2. 2.48.21.	Shall provide the capability to emphasize the selected SAFETY CONTOUR over other depth contours on the display, using the SENC COLOR TOKENS specified in Appendix 2 to IHO S-52.	V2
3.2. 2.48.22.	Shall provide the capability for a segment process and/or an operator to specify a SAFETY DEPTH.	V2
3.2. 2.48.23.	Shall provide the capability to emphasize soundings equal to or less than the SAFETY DEPTH (whenever spot soundings are selected for display) using SENC COLOR TOKENS specified in Appendix 2 to IHO S-52.	V2
3.2. 2.48.24.	Shall provide an indication of whether ownship’s position is covered by an SENC at a larger scale than that provided by the display.	V2
3.2. 2.48.25.	Shall provide a symbol set containing the symbols specified in Annex E to IEC 1174 to describe the following navigational elements and parameters:	V2
3.2. 2.48.25.1	Own ship	V2
3.2. 2.48.25.1.1	Past track with time marks for primary track	V2
3.2. 2.48.25.1.2	Past track with time marks for secondary track	V2
3.2. 2.48.25.2	Vector for course and speed made good	V2
3.2. 2.48.25.3	Variable range marker and/or electronic bearing line	V2
3.2. 2.48.25.4	Cursor	V2
3.2. 2.48.25.5	Event	V2
3.2. 2.48.25.5.1	Dead reckoning position and time (DR)	V2
3.2. 2.48.25.5.2	Estimated position an time (EP)	V2
3.2. 2.48.25.6	Fix and time	V2
3.2. 2.48.25.7	Position line and time	V2
3.2. 2.48.25.8	Transferred position line and time	V2
3.2. 2.48.25.8.1	Predicted tidal stream or current vector with effective time and strength (in box)	V2
3.2. 2.48.25.8.2	Actual tidal stream or current vector with effective time and strength (in box)	V2
3.2. 2.48.25.9	Danger highlight	V2
3.2. 2.48.25.10	Clearing line	V2
3.2. 2.48.25.11	Planned course and speed to make good.	V2
3.2. 2.48.25.11.1	Speed is shown in box.	V2
3.2. 2.48.25.12	Waypoint	V2

3.2. 2.48.25.13	Distance to run	V2
3.2. 2.48.25.14	Planned position with date and time	V2
3.2. 2.48.25.15	Visual limits of lights arc to show rising/dipping range	V2
3.2. 2.48.25.16	Position and time of “wheelover”.	V2
3.2. 2.48.26	Shall provide the capability to automatically display a SCALE BAR as part of the BASE DISPLAY when the scale of the SENC is 1:80,000 or larger.	V2
3.2. 2.48.26.1	The SCALE BAR is intended to give an immediate impression of scale and of the proximity of charted objects, rather than an accurate distance measurement.	V2
3.2. 2.48.27	Shall provide the capability to automatically display a LATITUDE BAR on the border of the STANDARD DISPLAY as when the scale of the SENC is smaller than 1:80,000.	V2
3.2. 2.48.27.1	The LATITUDE BAR is intended to give an immediate impression of scale and of the proximity of charted objects, rather than an accurate distance measurement.	V2
3.2. 2.48.28	Shall provide the capability to create a lattice overlay.	V2
3.2. 2.48.28.1	A lattice is a set of geographic points (i.e., points on the Earth's surface, as opposed to a plane or some other mathematical abstraction) overlaid with a set of polylines.	V2
3.2. 2.48.29	Shall be capable of using external graphics processors to perform X Window system graphics processing.	V2
3.2. 2.48.30	AS 3.2.1.2, AS 3.2.1.22 CG requires an auditory alert as well as visual alert.	V2
3.2. 2.48.31	AS 3.2.2.3, AS 3.2.2.4, 3.2.2.5 CG requires the name of the alert to be displayed, as well as the number pending.	V2
3.2. 2.48.32	AS 3.2.2.17 CG requires alerts to be filtered by time as well as origin, priority and class.	V2
3.2. 3	**Geospatial Data**	V1
3.2. 3.1	**Shall perform data base management functions**	V1
3.2. 3.1.1	Shall have the capability to import and export data sets in their standard format. (Number of data sets, maps and projections limited only by system size and hard drive capacity.)	V1
3.2. 3.1.1.1	The system shall allow operators to save, recall, delete, or export stored maps in the database.	V2
3.2. 3.1.2	Shall accept as input standard MCG&I data products from associated transfer and storage media.	V1
3.2. 3.1.2.1	Vector Product Format (VPF) data sets	V1
3.2. 3.1.2.1.1	WVS Plus	V1
3.2. 3.1.2.1.2	All level of VMAP	V1
3.2. 3.1.2.1.3	ITD	V1
3.2. 3.1.2.1.4	Urban Vector Map	V1
3.2. 3.1.2.1.5	DFLIP	V1
3.2. 3.1.2.1.6	Aeronautical Information DATA (AID)	V1
3.2. 3.1.2.1.7	VITD (Vector Product) Interim Terrain Data	V2
3.2. 3.1.2.1.8	Digital Nautical Chart (DNC)	V2

3.2. 3.1.2.1.9	All other produced VPF data sets conforming to the VPF specification.	V1
3.2. 3.1.2.2	Data sets conforming to the Raster Product Format (RPF), including CADRG and CIB.	V1
3.2. 3.1.2.2.1	CADRG	V1
3.2. 3.1.2.2.2	CIB	V1
3.2. 3.1.2.2.3	ADRG (ARC Digitized Raster Graphics)	V1
3.2. 3.1.2.2.4	Digital Point Positioning Database (Digital PPDB)	V1
3.2. 3.1.2.3	Compressed Digital Terrain Elevation Data (when available).	V1
3.2. 3.1.2.4	Modernized Intelligence Database (MIDB).	V2
3.2. 3.1.2.5	DTED (Digital Terrain and Elevation Data)	V1
3.2. 3.1.3	Shall accept as input these data sets from their associated storage and distribution media	V1
3.2. 3.1.3.1	Gazetteer (when available)	V1
3.2. 3.1.3.2	DAFIF	V1
3.2. 3.1.3.3	Shall support a run-time "hasty" method for downsampling the 24-bit ADRG colors to fewer than 256 colors.	V1
3.2. 3.1.3.4	World Port Index (WPI)	V2
3.2. 3.1.3.5	Modernized Intelligence Database (MIDB).	V2
3.2. 3.1.4	Shall accept these non-maintained data sets from all their associated storage and distribution media.	V1
3.2. 3.1.4.1	Digital feature analysis data (DFAD), levels 1, 1c, 2, 3c	V1
3.2. 3.1.4.2	World vector shoreline (WVS) in Standard Linear Format (SLF)	V1
3.2. 3.1.4.3	Digital chart of the world (DCW)	V1
3.2. 3.1.4.4	Probabilistic vertical obstruction data (PVOD)	V1
3.2. 3.1.4.5	Arc digital raster imagery (ADRI)	V1
3.2. 3.1.4.6	Compressed Aeronautical Chart (CAC) (NV)	V1
3.2. 3.1.4.7	E-MAP (AR)	V1
3.2. 3.1.4.8	DADRG (AR)	V1
3.2. 3.1.4.9	Common Mapping Standard (CMS)	V1
3.2. 3.1.4.10	Interim Terrain Data (ITD) and Planning Interim Terrain Data (PITD) in SLF	V1
3.2. 3.1.5	Shall handle data file formats used by commercial image processing	V1
3.2. 3.1.6	Shall support elevation data in application-specified resolutions.	V1
3.2. 3.1.7	Store analysis values for such functions as mobility and terrain	V1
3.2. 3.1.7.1	Mobility and terrain	V1
3.2. 3.1.7.2	Shall store analysis values with metadata including a time and date stamp	V1
3.2. 3.1.8	Map layers or data in supported formats (e.g. RPF or VPF) The files may represent both raster and vector data.	V1
3.2. 3.1.8.1	Save the state and display configuration of the current map for later retrieval.	V1
3.2. 3.1.8.2	Store Perspective information and image geometry.	V1
3.2. 3.1.8.3	Shall provide an indication that a map has been updated (i.e. replaced, CHUMed, etc.) when that map is displayed.	V2
3.2. 3.2	**Shall support a data dictionary which includes data definitions for spatial data entities, relationships, and attributes**	V1
3.2. 3.2.1	Shall provide data dictionary values for all supported data formatted data formats and products.	V1

3.2. 3.2.2	Shall support	V1
3.2. 3.2.2.1	Create	V1
3.2. 3.2.2.2	Update	V1
3.2. 3.2.2.3	Delete	V1
3.2. 3.2.2.3.1	Delete shall include authorization constraints.	V2
3.2. 3.2.2.4	Report of data in the data dictionary	V1
3.2. 3.2.2.5	Report relationally linked entities.	V2
3.2. 3.3	**Shall store metadata in a format defined by the document.**	V1
3.2. 3.4	**Shall support management of source data files for MCG&I data products**	V1
3.2. 3.4.1	Copy	V1
3.2. 3.4.2	Rename	V1
3.2. 3.4.3	Move	V1
3.2. 3.4.4	Delete	V1
3.2. 3.4.5	Allow for stacking	V1
3.2. 3.4.6	Allow for subsetting	V1
3.2. 3.4.7	Allow for paneling	V1
3.2. 3.4.8	Allow for integration of geographic data sets.	V1
3.2. 3.4.9	Provide capability to retrieve a list of data base file names.	V1
3.2. 3.4.9.1	Provide a list of both on-line and off-line databases filtered by data base type and scale for text display and output	V1
3.2. 3.4.9.2	Shall have the capability to read and use NIMA digital catalog, Modernized Catalog System (MCS).	V1
3.2. 3.4.9.3	Geographic reference, data base type and scale for text display and output.	V1
3.2. 3.4.9.4	Shall allow examining of listing of locally-produced geographic databases, writebacks, and other geographically-referenced scanned material.	V1
3.2. 3.4.10	Provide capability to (See Paragraphs (3.2.)5.5.2. and (3.2.)2.9.2).	V1
3.2. 3.4.10.1	File size	V1
3.2. 3.4.10.2	File contents	V1
3.2. 3.4.10.3	Data base accuracy	V1
3.2. 3.4.10.4	Other available metadata information such as	V1
3.2. 3.4.10.4.1	Currency date	V1
3.2. 3.4.10.4.2	Resolution	V1
3.2. 3.4.10.4.3	Source datum in accordance with FGDC metadata content standard (FIP PUB TBD)	V1
3.2. 3.4.10.5	The specified data source, accuracy, and scale used to establish the precision of coordinate displays.	V1
3.2. 3.4.11	Provide backup and restore of files to and from removable storage media.	V1
3.2. 3.4.12	Provide a capability to import and export MCG&I files.	V1
3.2. 3.4.12.1	Shall support interactive transfer of AOI data bases to writable media supported storage	V1
3.2. 3.4.13	Determine if one point is visible at the position of the start point	V1
3.2. 3.5	**Shall store and manage graphical information produced by the**	V1

	JMTK.	
3.2. 3.5.1	Store	V1
3.2. 3.5.2	Retrieve	V1
3.2. 3.5.3	Report graphic snapshots of map layers with graphic symbology.	V1
3.2. 3.5.4	Shall support import and export of graphic data in	V1
3.2. 3.5.4.1	NITF formats	V1
3.2. 3.5.4.2	CGM formats	V1
3.2. 3.5.4.3	TIFF formats	V1
3.2. 3.6.	**Shall support the National Imagery Transmission Format Standard (NITF).**	V1
3.2. 3.6.1	Input	V1
3.2. 3.6.2	Storage	V1
3.2. 3.6.3	Query and retrieval of image	V1
3.2. 3.6.3.1	Ability to establish a link to an image.	V2
3.2. 3.6.4	Graphics data formatted in the version 1.1 and 2.0 of the National Imagery Transmission Format Standard (NITF)	V1
3.2. 3.7.	**Shall support the decompression of input data bases that have been previously compressed.**	V1
3.2. 3.7.1	NITF compression schemes	V1
3.2. 3.7.2	Digitized map compression scheme	V1
3.2. 3.7.3	Imagery compression scheme	V1
3.2. 3.7.4	Gridded products such as DTED.	V2
3.2. 3.8.	**Shall support creation of areas-of-interest (AOI) of any size with any combination of available standard input data bases and scales as selected by the application**	V1
3.2. 3.9.	**Support Data Query for the following**	V1
3.2. 3.9.1	The visibility of the selected feature.	V1
3.2. 3.9.2	The name of the selected feature.	V1
3.2. 3.9.3	The name of the selected map in the display configuration.	V1
3.2. 3.9.4	The name of the selected overlay.	V1
3.2. 3.9.5	The visibility of the selected map.	V1
3.2. 3.9.6	The visibility of the selected overlay.	V1
3.2. 3.9.7	The area of interest for the selected map.	V1
3.2. 3.9.8	List of the names of the maps associated with the selected display configuration.	V1
3.2. 3.9.9	List of the names of the overlays associated with the selected map.	V1
3.2. 3.9.10	The range of the selected map window to view surface coordinates.	V1
3.2. 3.9.11	The projection type for the selected map.	V1
3.2. 3.9.12	The position of the selected map center.	V1
3.2. 3.9.13	The selected map scale.	V1
3.2. 3.9.14	The range of the selected map window in altitude/longitude coordinates.	V1
3.2. 3.9.15	List of the names of the features associated with the selected overlay.	V1
3.2. 3.9.16	The number of the selected overlay.	V1
3.2. 3.9.17	The color associated with the specified index in the selected feature.	V1

3.2. 3.9.18	The latitude/longitude coordinates of each point of a drawn polygon.	V1
3.2. 3.9.19	The latitude/longitude coordinates of a drawn polyline.	V1
3.2. 3.9.20	The coordinates of a picked point.	V1
3.2. 3.9.21	The two corner points of a drawn rectangle.	V1
3.2. 3.9.22	The distance over terrain between interactively picked points.	V1
3.2. 3.9.23	The selected visibility of the ADRG legend indicated.	V1
3.2. 3.9.24	The visibility of the Coordinate Precision window.	V1
3.2. 3.9.25	The visibility of the coverage legend.	V1
3.2. 3.9.26	The visibility of the map legend.	V1
3.2. 3.9.27	The visibility of the PMP error legend.	V1
3.2. 3.9.28	The map and feature being used for the selected display.	V1
3.2. 3.9.29	The visibility of the selected inset.	V1
3.2. 3.9.30	List of all the maps and features of the selected display configuration.	V1
3.2. 3.9.31	List of the names of the colors in the selected device file.	V1
3.2. 3.9.32	The selected state of the background mode flag.	V1
3.2. 3.9.33	List of the format names in the selected format file.	V1
3.2. 3.9.34	The number of primitives in the selected format.	V1
3.2. 3.9.35	List of the IDs of all the objects in the selected feature.	V1
3.2. 3.9.36	The position, rotation and scale factors of the specified object.	V1
3.2. 3.9.37	The position of the specified object.	V1
3.2. 3.9.38	The rotation of the specified object.	V1
3.2. 3.9.39	The scale factors of the specified object.	V1
3.2. 3.9.40	The text string for the requested primitive.	V1
3.2. 3.9.41	The visibility of the specified object.	V1
3.2. 3.9.42	The visibility of the selected primitive in the specified object.	V1
3.2. 3.9.43	The data for the specified informational primitive of the specified object.	V1
3.2. 3.9.44	The color for the primitive number within the specified object.	V1
3.2. 3.9.45	The font file pathname for the requested primitive.	V1
3.2. 3.9.46	The position for the named primitive.	V1
3.2. 3.9.47	The style attributes for the specified primitive.	V1
3.2. 3.9.48	The type of the given primitive in the selected format.	V1
3.2. 3.9.49	The visibility of the track history of the specified object if the history is on.	V1
3.2. 3.9.50	The pick value for the selected feature.	V1
3.2. 3.9.51	The pick value for the specified object.	V1
3.2. 3.9.52	The selected value of the pickability flag for the selected feature.	V1
3.2. 3.9.53	The selected pick center in screen pixel coordinates.	V1
3.2. 3.9.54	The selected pick radius in units of pixels.	V1
3.2. 3.9.55	The selected value of the pick threshV1.	V1
3.2. 3.9.56	List of pickable objects for the selected feature.	V1
3.2. 3.9.57	List of objects within a polygon that qualify for a pick.	V1
3.2. 3.9.58	Whether the specified object is highlighted, and the highlight color.	V1
3.2. 3.9.59	List of the IDs of all the object links.	V1
3.2. 3.9.60	Information about the specified link.	V1
3.2. 3.9.61	The selected visibility of an object link.	V1
3.2. 3.9.62	The radar parameters used specifically by the Radar Target Detection function.	V1
3.2. 3.9.63	The radar parameters for a specified radar.	V1
3.2. 3.9.64	The line-of-sight distance and visibility from one point to another.	V1

3.2. 3.9.65	The earth type used to generate a terrain mask. Query Terrain Masks.	V1
3.2. 3.9.66	The angle off true or magnetic north for two interactively picked points.	V1
3.2. 3.9.67	The terrain elevation of an interactively picked point.	V1
3.2. 3.9.68	The coordinates of an interactively picked point.	V1
3.2. 3.9.69	List of minimum and maximum elevations within a given AOI.	V1
3.2. 3.9.70	The vehicle parameters for a specified vehicle.	V1
3.2. 3.9.71	The distance along a three-dimensional air path.	V1
3.2. 3.9.72	The distance along a ground path.	V1
3.2. 3.9.73	The distance between two positions.	V1
3.2. 3.9.74	The position of the light source of a relief shade.	V1
3.2. 3.9.75	The value from a data base grid corresponding to a given map coordinate.	V1
3.2. 3.9.76	The bearing between two positions.	V1
3.2. 3.9.77	The elevation of the given world coordinate position.	V1
3.2. 3.9.78	Selected display precision settings.	V1
3.2. 3.9.79	The great circle distance between two interactively picked points.	V1
3.2. 3.9.80	The distance between interactively picked points.	V1
3.2. 3.9.81	The visibility of the map accuracy legend.	V1
3.2. 3.9.82	The ASCII version of a double floating point number to a given precision.	V1
3.2. 3.9.83	The ASCII version of a floating point number to a given precision.	V1
3.2. 3.9.84	Load a V2 fill pattern.	V1
3.2. 3.9.85	Elevation accuracy data for a given lat/long	V1
3.2. 3.9.86	Shall provide a capability to query based on region, data or product type, features classes attributes.	V1
3.2. 3.9.86.1	Queries with a location and a proximity range	V1
3.2. 3.9.86.2	Containment queries	V1
3.2. 3.9.86.3	Adjacency queries	V1
3.2. 3.9.86.4	Spatial metric queries (length, area, distance, azimuth)	V1
3.2. 3.9.86.5	Boolean combination of queries	V1
3.2. 3.9.87	Shall provide an interface to COTS software necessary for applications to utilize the following DBMS capabilities:	V2
3.2. 3.9.87.1	Ad hoc (i.e., relational, spatial, and combined) database queries.	V2
3.2. 3.9.88	The spatial query capability should not display database information by default however the interrogating process may provide a separate alphanumeric area (or window) to display the object information.	V2
3.2. 3.10	**Shall perform matrix merging of similar matrix features from the database.**	V1
3.2. 3.11	**Shall support Digital Chart Update (DCHUM) display and management.**	V1
3.2. 3.12	**Shall accept ADRG, ADRI, and DTED data in accordance with ESD-82155046A004 and RPF data in accordance with MIL-STD-2411-1 and MIL-STD-2411-2.**	V2
3.2. 3.12.1	RPF products shall include CADRG (MIL_C_89038) and CIB (MIL-C-89041).	V2

3.2. 3.12.2	Shall provide for the processing ADRG data with compression ratio of 55:1 (MIL-C-89038).	V2
3.2. 3.12.3	Shall accept VPF data in accordance with MIL-STD-2407.	V2
3.2. 3.13	**Shall accept and transmit MCG&I data as well as MCG&I patch files.**	V2
3.2. 3.14	**Shall provide a mechanism to prepare and export MCG&I data and DAFIF data based on the selection of geographical defined rectangular polygonal and circular regions.**	V2
3.2. 3.14.1	Shall allow the region to be defined as a corridor of a defined width along a specific path.	V2
3.2. 4	**Local Imagery Preprocessing**	V1
3.2. 4.1.	**Shall provide rudimentary and basic image processing functions.**	V2
3.2. 4.1.1	Image enhancement shall be available to perform contrast stretching on imagery.	V2
3.2. 4.1.1.1	Rasterize area feature into grid.	V2
3.2. 4.1.1.2	Rasterize line feature into grid.	V2
3.2. 4.1.1.3	Rasterize point feature into grid.	V2
3.2. 4.1.1.4	Display Area Gradient raster output.	V2
3.2. 4.1.1.5	Change the visibility of the current map.	V2
3.2. 4.1.1.6	Change a features visibility.	V2
3.2. 4.1.1.7	Change the visibility of the current overlay.	V2
3.2. 4.1.1.8	Convert a 24 bit image to an 8 bit image, then displays it in a dynamic window.	V2
3.2. 4.1.1.9	Convert a 24 bit image to an 8 bit image, then displays it in a widget.	V2
3.2. 4.1.1.10	Fade the previously initialized feature by the percent indicated.	V2
3.2. 4.1.1.11	Restore faded feature to its original color.	V2
3.2. 4.1.1.12	Generate Fast Perspective as an 8 bit image.	V2
3.2. 4.1.1.13	Generate a Radar Envelope over a Perspective view as a 24 bit image.	V2
3.2. 4.1.1.14	Interactively select and extracts an area of a screen image.	V2
3.2. 4.1.1.15	Generate Forward Looking Infrared Radar (FLIR) return as an 8 bit image.	V2
3.2. 4.1.1.16	Generate Low Level Light Television (LLLTV) return as an 8 bit image.	V2
3.2. 4.1.1.17	Generate Radar return as a 8 bit image.	V2
3.2. 4.1.1.18	Generate Synthetic Aperture Radar (SAR) and make available as an 8 bit image.	V2
3.2. 4.1.1.19	Map a 24-bit image to color colormap indices.	V2
3.2. 4.1.1.20	Map an 8-bit image to gray scale colormap indices.	V2
3.2. 4.1.2	Rotation of the map windows, including all map layers, shall be provided.	V2
3.2. 4.1.2.1	Allow the interactive acceptance or rejection of the generated object filter.	V2
3.2. 4.1.2.2	Display an 8-bit image in a scrolled window.	V2
3.2. 4.1.2.3	Create a gray scale colormap.	V2

3.2. 4.1.2.4	Apply and plot an area edge filter to the designated image area.	V2
3.2. 4.1.2.5	Apply and plot an equal probability quantified filter to the designated image area.	V2
3.2. 4.1.2.6	Apply and plot a floating point smoothing filter to the designated image area.	V2
3.2. 4.1.2.7	Apply and plot an integer smoothing filter to the designated image area.	V2
3.2. 4.1.2.8	Apply and plot a point edge detection filter to the designated image area.	V2
3.2. 4.1.2.9	Apply and plot a Sobel filter to the designated image area.	V2
3.2. 4.1.2.10	Apply and plot an edge sharpening filter to the designated image area.	V2
3.2. 4.2.	**Basic Image Manipulation Services. Shall include the capability to perform standard transformations of image data to include:**	V2
3.2. 4.2.1	Roam. Shall provide a user the capability to roam continuously and by increments over all imagery types and imagery products.	V2
3.2. 4.2.1.1	Interactive Roam. Shall provide a user the capability to initiate continuous interactive roam.	V2
3.2. 4.2.1.2	Direct Entry Incremental Roam. Shall provide a user he capability to directly enter ground distances into a roam request form to specific incremental roam .	V2
3.2. 4.2.2	Zoom. Shall provide a user the capability to zoom continuously and by increments over all imagery types and imagery products .	V2
3.2. 4.2.2.1	Interactive Zoom. Shall provide the capability to initiate continuous interactive zoom .	V2
3.2. 4.2.2.2	Direct Entry Zoom. Shall provide a user the capability to directly enter magnification parameters into a zoom request form for items to be scaled.	V2
3.2. 4.2.3	Rotation. Shall provide a user the capability to rotate continuously and by user-specified increments for all imagery types and imagery products.	V2
3.2. 4.2.3.1	Interactive Rotation. Shall provide a user with the capability to initiate continuous interactive rotation through any angle in a clockwise/counter clockwise direction.	V2
3.2. 4.2.3.2	Direct Entry Rotation. Shall provide a user the capability to directly enter angles between 0 and 360 degrees into a rotation request form to specify rotation.	V2
3.2. 4.2.4	Orientation Service. Shall provide a user the capability to orient all imagery types and imagery products continuously and by user-specified increments.	V2
3.2. 4.2.4.1	Interactive Orientation. Shall provide a user the capability to perform continuous orientation through any angle in a clockwise/counter clockwise direction.	V2
3.2. 4.2.4.2	Direct Entry Orientation. Shall provide a user the capability to specify orientation by directly entering angle values between 0 and 360 degrees into an orientation request form.	V2
3.2. 4.2.5	Brightness Adjustment. Shall provide a user the capability to interactively and continuously adjust the brightness on all imagery types and imagery products.	V2

3.2. 4.2.6	Contrast Adjustment. Shall provide a user the capability to interactively and continuously adjust the contrast on all imagery types and imagery products.	V2
3.2. 4.3.	**Basic Mensuration Services. Shall provide the user the capability to perform standard mensuration functions to include:**	V2
3.2. 4.3.1	Linear Measurement and Summation. Shall provide a user the capability to calculate and sum linear measurements all imagery types and imagery products.	V2
3.2. 4.3.1.1	Interactive Linear Measurement. Shall provide a user the capability to interactively select two or more points to initiate the calculation of segment distances.	V2
3.2. 4.3.1.1.1	Linear Measurement Summation Option. The user shall also be provide the option to compute the summation of 2 or more segment distances.	V2
3.2. 4.3.1.2	Direct Entry Linear Measurement. Shall provide a user the capability to directly enter coordinates for two or more points into a linear measurement form to initiate the calculation of segmented distances.	V2
3.2. 4.3.1.2.1	Direct Linear Measurement Summation Option. The user shall also be provide the option to request the summation of 2 or more segment distances.	V2
3.2. 4.3.2.	Circumference Measurement. Shall provide a user the capability to select 2 or more points to initiate the calculation of circumference.	V2
3.2. 4.4.	**Basic Registration Services. Shall provide a user the capability to transform pairs of images or graphics to each other or to a spatial reference grid, so that they are geometrically aligned, using image-to-geospatial registration.**	V2
3.2. 4.5.	**Basic Location Services. Shall provide a user the capability to perform point location functions, which consist of:**	V2
3.2. 4.5.1	Rapid Positioning Capability (RPC). Shall provide a user the capability to interactively select a point to initiate the calculation of the point position and accuracy of the position.	V2
3.2. 4.5.1.1	Coordinate Display Options. Shall provide a user the capability to specify coordinate type, i.e., UTM, geocoordinates and image coordinates.	V2
3.2. 4.5.2	Geolocation. Shall provide a user the capability to enter UTM, geocoordinates and image coordinates to initiate the point location search.	V2
3.2. 4.5.3	Grid Services. Shall provide a user the capability to apply standard, custom and computer generated grids over all imagery types and imagery products.	V2
3.2. 4.5.3.1	Standard Grid. Shall provide a user the capability to select predefined geographic and UTM coordinate grids to overlay on geocorrected imagery .	V2
3.2. 4.5.3.1.1	Define Increments for Grid. The user shall have the capability to define the increments of measure for the grid.	V2

3.2. 4.5.3.2	Custom Grid. Shall provide a user the capability to define custom reference grids to overlay selected imagery, using image coordinates.	V2
3.2. 4.5.3.3	Computer Generated Grid. Shall provide a user the capability to request a computer generated reference grid to overlay selected imagery, with user specified axis labels.	V2
3.2. 4.5.4	Coordinate Conversion. Shall provide a user the capability to convert geographic coordinates to UTMs and UTMs to geographic coordinates.	V2
3.2. 4.5.5	Imagery Detail. Shall provide a user the capability to select from a menu and view pertinent details, in icon form, i.e., north arrows and energy direction, for all displayed imagery types.	V2
3.2. 4.6.	**Basic Elevation and Terrain Services. Shall provide a user the capability to perform:**	V2
3.2. 4.6.1	Elevation Extraction Services. Shall provide a user the capability to extract elevation information as described in the following subparagraph.	V2
3.2. 4.6.1.1	Interactive Feature Elevation Extraction. Shall provide a user the capability to interactively select points to calculate feature elevations such as buildings, towers, mountains, etc..	V2
3.2. 4.6.2	Continuous Elevation Display. Shall provide a user the capability to display continuous elevation readout.	V2
3.2. 4.6.3	Spot Elevation. Shall provide a user the capability to display minimum and maximum spot elevations on all imagery types and imagery products.	V2
3.2. 4.6.4	Terrain Classification. Shall provide a user the capability to interactively select a point or area on an image to view terrain classification, which includes vegetation.	V2
3.2. 4.6.4.1	This implies that the terrain has already been classified and the operator is viewing the previously-determined classification.	V2
3.2. 4.6.5	Obscuration Profiling. Shall provide a user the capability to use digital elevation data and weather data to generate profiles showing visual, signal or infrared obscuration between selected points.	V2
3.2. 4.6.5.1	Interactive Obscuration Profiling. Shall provide a user the capability to interactively select two points on a displayed image and display to the user those areas that may cause signal, visual or infrared obscuration on the displayed image.	V2
3.2. 4.6.5.2	Direct-entry Obscuration Profiling. Shall provide a user the capability to directly enter two points, geocoordinates or UTM, into an obscuration profile form.	V2
3.2. 4.6.5.2.1	And, display to the user a list of possible signal, visual or infrared observation points that lie within the set of specific coordinates.	V2
3.2. 4.6.6	Image Perspective Transformation (IPT) Service. Shall provide a user the capability to display three-dimensional terrain and elevation data over imagery, with the capability to select and modify the depiction method, i.e., slope cones, elevation bands.	V2
3.2. 4.6.6.1	Image Perspective Transformation (IPT). Shall provide a user the capability to request image perspective transformation to apply to selected imagery.	V2

3.2. 4.6.6.1.1	Depiction Display Options. Shall provide a user the capability to specify depiction type, i.e., slope cones, elevation bands.	V2
3.2. 4.6.6.2	Image Perspective Transformation (IPT) Display. Shall display to the user a three-dimensional view of the selected image in the user specified depiction method.	V2
3.2. 4.7.	**Basic Data Selection Services. Shall provide a user the capability to indicate Regions of Interest (ROI) within displayed data in order to modify it in some way using available image manipulation functions to clip imagery and types and imagery products.**	V2
3.2. 4.7.1	Region of Interest (ROI) Selection. Shall provide a user the capability to select regions of interest (ROI) by interactive selection or direct entry.	V2
3.2. 4.7.1.1	The user shall then have the capability to apply all image manipulation functions to the ROI independently of the original image.	V2
3.2. 4.7.1.1.1	The user shall also have the capability to save the ROI independent of the original display.	V2
3.2. 4.7.1.2	Interactive Region of Interest (ROI). Shall provide a user the capability to identify an ROI by interactively selecting three or more points on a display image.	V2
3.2. 4.7.1.2.1	Direct-entry Region of Interest (ROI). Shall provide a user the capability to directly enter three or more geocoordinates, UTM or image coordinates, into an ROI form.	V2
3.2. 4.7.1.3.	Interactive Region of Interest (ROI) Display. Shall display to the user the area selected in a "picture-to-picture" format and can be manipulated independently of original display.	V2
3.2. 4.7.1.3.1	Region of Interest (ROI) Display. Shall display to the user specified area in a "picture-to-picture" format and can be manipulated independently of origina display.	V2
3.2. 4.7.2	Highlighting Service. Shall provide a user the capability to identify areas by interactive selection or direct entry for all imagery types and imagery products.	V2
3.2. 4.7.2.1	The user will then have a capability to fill the selected areas with color and/or pattern independently of the original display.	V2
3.2. 4.7.2.2	Interactive Highlighting. Shall provide a user the capability to interactively select three or more points on a displayed image.	V2
3.2. 4.7.2.3	Direct-entry Highlighting. Shall provide a user the capability to directly enter three or more geocoordinates, UTM or image coordinates, into a highlighting form.	V2
3.2. 4.7.2.4	The user will then be able to highlight the interactively or directly selected picture with color and patterns independent of the original display.	V2
3.2. 4.8.	**Basic Annotation Services. Shall provide a user the capability to place symbology, text and graphics overlaid upon the imagery to highlight significant content. Annotation may be turned off/on at the users discretion.**	V2

3.2. 4.8.1	Annotation Creation. Shall provide a user the capability to create and save images annotations. These annotations may be comprised of text strings, graphics, symbolic and iconic elements superimposed over imagery.	V2
3.2. 4.8.1.1	Superimposed Display. Shall provide the user the capability to display annotations super imposed over imagery. The user will be able to view a display of the annotation overlay, the image itself or both.	V2
3.2. 4.8.1.2	Symbol Selection. Shall provide the user the capability to select icons and other symbols from a library (or libraries) of standard symbols for placement on an overlay.	V2
3.2. 4.8.1.3	Image-Based Annotation. Shall provide the user the capability to generate annotations which are image-based. Regardless of the action performed upon the image, all annotation elements shall retain their position relative to the underlying image.	V2
3.2. 4.8.2	Annotation Editing. Shall provide the user the capability to edit annotations.	V2
3.2. 4.8.2.1	Edit Annotation Elements. Shall provide the user the capability to modify existing graphics, symbols and icons and store them as elements for reuse.	V2
3.2. 4.8.2.2	Element Style Selection. Shall provide the user the capability to modify the styles, color, size, and font of annotation elements (including but not limited to text, lines, curves, symbols, and polygons).	V2
3.2. 4.8.2.3	Annotation Move and Copy. Shall provide the user the capability to move and copy icons.	V2
3.2. 4.8.2.4	Rotation and Scale. Shall provide the user the capability to rotate and scale graphics, symbols, and icons, when retrieved or created, relative to the displayed image.	V2
3.2. 4.9.	**Basic Video Service. Shall provide the capability to record and playback video from any source.**	V2
3.2. 4.10.	**Export Service. Shall provide an application programming interface (API) for an application to specify a data product and an area of interest for export of selected imagery data (ADRI, CIB, NITF).**	V2
3.2. 4.11.	**Import Service. Shall provide the capability to import, catalog, retrieve, display, print, and manage images supplied in the NIF format defined in MIL-STD-2500 and MIL-HDBK-1300.**	V2
3.2. 4.12.	**Basic Collaboration Service. Shall provide the capability for cooperative activity that includes text and audio chat and shared whiteboard that can be used for non-destructive annotation of images with text and/or graphics.**	V2
3.2. 4.13.	**Advanced Image Manipulation Services. Shall include the capability to perform all of the Basic Image Manipulation functionality's. These services shall include the following capabilities for:**	V2

3.2. 4.13.1	Pixel Resolution. Shall provide a user the capability to change pixel size through resampling techniques for all imagery types and imagery products.	V2
3.2. 4.13.1.1	Image resampling is related to zoom except it applies to the actual imagery, rather than the displayed window of imagery.	V2
3.2. 4.13.2	Sharpening. Shall provide a user the capability to perform interactive edge sharpening on all imagery types and imagery products.	V2
3.2. 4.13.3	Smoothing. Shall provide a user the capability to perform interactive edge smoothing on all imagery types and imagery products.	V2
3.2. 4.13.4	Dynamic Range Adjustment. Shall provide the capability for interactive modification of the images dynamic range, i.e., it will provide the capability to change the number and type of values used to represent the image on a per-pixel basis.	V2
3.2. 4.13.5	Histogram Manipulation. Shall provide the capability for interactive modifications of the distribution of image values in an image.	V2
3.2. 4.13.5.1	In example, it will provide the capability to manipulate the histogram of an image to generate a close relative of the original image with V2 histogram statistics.	V2
3.2. 4.13.6	Haze Reduction. Shall provide a user the capability to perform interactive haze reduction on all imagery types and imagery products.	V2
3.2. 4.13.7	Color Table Manipulation. Shall provide a user the capability to perform color table manipulation on all imagery types and imagery products.	V2
3.2. 4.13.8	Pseudocolor Assignment Service. Shall provide a user the capability to apply pseudocolor to all imagery types and imagery products.	V2
3.2. 4.13.9	Despeckle Filter. Shall provide a user the capability to apply a despeckle filter to radar imagery.	V2
3.2. 4.14.	**Advance Mensuration Services. Shall provide the user the capability to perform standard mensuration functions to include multi-dimensional measurement and summation.**	V2
3.2. 4.14.1	Multi-dimensional Measurement and Summation. Shall provide a user the capability to calculate and sum multi-dimensional measurements on all imagery types and imagery products.	V2
3.2. 4.14.1.1	Interactive Multi-dimensional Measurement. Shall provide a user the capability to select three or more points to initiate the calculation of an object capacity such as area, volume, etc.	V2
3.2. 4.14.1.1.1	Multi-dimensional Summation Option. Shall provide a user the capability to select the option to compute the summation of multi-dimensional measurements.	V2
3.2. 4.14.1.1.2	Direct Entry Multi-dimensional Summation. Shall provide a user the capability to enter values of 2 or more multi-dimensional measurements into a summation form to initiate the calculation of the sum.	V2
3.2. 4.15.	**Advanced Registration Services. Shall provide a user the capability to transform pairs of images or graphics to each other or to a spatial reference grid, so that they are geometrically aligned, using the following:**	V2

3.2. 4.15.1	Image-to-Image Registration. Shall provide a user the capability to interactively select ground control points to initiate the registration of selected imagery pairs.	V2
3.2. 4.15.2	Image-to-Image Warping. Shall provide a user the capability to interactively select control points to initiate the warping of selected imagery pairs.	V2
3.2. 4.15.3	Graphics-to-Image Warping Service. Shall provide a user the capability to interactively select control points to warp a specified graphic to an image or an image to a graphic.	V2
3.2. 4.15.4	Data Fusion. Shall provide a user the capability to "burn" radar/IR highlights into optical imagery.	V2
3.2. 4.16.	**Advanced Elevation and Terrain Service. Shall provide a user the capability to perform area elevation extraction.**	V2
3.2. 4.16.1	Area Elevation Extraction. Shall provide a user the capability to extract elevation data of an imaged area at designated intervals, providing a grid of digital elevation data overlaid on displayed imagery.	V2
3.2. 4.17.	**Advanced Data Comparison Services. Shall provide a user the capability to analyze image features through direct comparison using image overlay, flicker, blend/fade, and wipe for all imagery types and products.**	V2
3.2. 4.17.1	Imagery Overlay. Shall provide a user the capability to overlay two or more images from any sensor for data comparison.	V2
3.2. 4.17.1.1	The overlaid imagery will appear as a single image with attributes from each of the images visible i.e., radar returns displayed on an optical image.	V2
3.2. 4.17.2	Flicker. Shall provide a user he capability to flicker back and forth between two images which are laid one over the other so that only one is visible at a time.	V2
3.2. 4.17.2.1	The user will then be able to switch back and forth between images at a user-specified flicker speed.	V2
3.2. 4.17.3	Blend/Fade. Shall provide the user the capability to blend and (/or) fade between two overlaid images or combinations of images or graphics.	V2
3.2. 4.17.3.1	Transparency. The user will be able to change the transparency of the top image so that the images blend together as the top one fades.	V2
3.2. 4.17.3.2	Degree of Transparency. The user will be able to control the degree of transparency from full opaque to full transparent.	V2
3.2. 4.17.4	Imagery Wipe. Shall provide a user the capability to wipe between two overlaid images and graphics.	V2
3.2. 4.17.4.1	Wipe Directions. The user will be able to wipe horizontally or vertically across the display.	V2
3.2. 4.17.4.2	Wiping. As the user wipes across the display, horizontally or vertically, the top image disappears, allowing the lower image to appear in its place.	V2

3.2. 4.18.	**Advanced Annotation Services. Shall provide a user the capability to place symbology, text and graphics overlaid upon the imagery to highlight significant content. Annotation may be turned off/on at the users discretion.**	V2
3.2. 4.18.1	Image-Based Registration. Shall provide the user the capability to register annotations to user-specified points on the display of the image or map graphic.	V2
3.2. 4.19.	**Advanced Collaboration Service. Shall provide the user the capability for simultaneous manipulation of the same image data displayed at multiple workstations from changes initiated at any workstation.**	V2
3.2. 4.20.	**Advance Mosaicing Services. Shall provide the user a capability to create a mosaic using multiple images of adjoining or overlapping areas. Shall also allow the user to display and manipulate the mosaiced imagery.**	V2
3.2. 4.21.	**Advanced Video Services. Shall provide the user the capability to segregate a 'clip' for forwarding. Shall also allow the user to 'freeze' a single frame to perform manipulation functions applications to 'still' imagery.**	V2
3.2. 4.22.	**Continuous Geographic Location Display. Shall provide a user the capability to continuously display geographic location.**	V2
3.2. 4.23.	**Shall provide the capability to save pictures in universal picture formats (TIFF, BMP, PCX, GIF, EPS, etc.).**	V2
3.2. 5	**Utilities**	V2
3.2. 5.1	**Error Messages**	V2
3.2. 5.1.1	Errors messages should be provided to alert users about problems.	V2
3.2. 5.2	**Architecture and Design.**	V2
3.2. 5.2.1	Shall provide Application Programming Interfaces (APIs) to the following functionality:	V2
3.2. 5.2.1.1	Shall provide Application Programming Interfaces (APIs) to the following visual functionality:	V2
3.2. 5.2.1.1.1	Specification of Area of Interest (AOI).	V2
3.2. 5.2.1.1.2	Specification of Data Product(s) for Visualization.	V2
3.2. 5.2.1.1.3	Specification of Perspective View. Shall be provided with appropriate parameters for:	V2
3.2. 5.2.1.1.3.1	Flat shading.	V2
3.2. 5.2.1.1.3.2	Smooth shading.	V2
3.2. 5.2.1.1.3.3	Diffuse lighting model.	V2
3.2. 5.2.1.1.3.4	Visual prediction.	V2

3.2. 5.2.1.1.3.5	Local viewer lighting model.	V2
3.2. 5.2.1.1.3.6	Radar prediction (all effects).	V2
3.2. 5.2.1.1.3.7	Visibility attenuation.	V2
3.2. 5.2.1.1.3.8	Anti-aliasing.	V2
3.2. 5.2.1.1.4	Specification of Projection.	V2
3.2. 5.2.1.1.5	Specification of Scale.	V2
3.2. 5.2.1.1.6	Specification of Declutter Criteria.	V2
3.2. 5.2.1.1.6.1	Which VPF Coverage's to visualize.	V2
3.2. 5.2.1.1.6.2	Which VPF FACC codes to visualize.	V2
3.2. 5.2.1.1.7	Rendering of specific data into an interface independent data structure.	V2
3.2. 5.2.1.2	Shall provide Application Programming Interfaces (APIs) to the following symbol functionality:	V2
3.2. 5.2.1.2.1	Specification of Symbology used for rendering of VPF data.	V2
3.2. 5.2.1.2.2	Specification of Color used for rendering of VPF data.	V2
3.2. 5.2.1.3	Shall provide Application Programming Interfaces (APIs) to the following analysis functionality:	V2
3.2. 5.2.1.3.1	Specification of Data Product(s) for Analysis.	V2
3.2. 5.2.1.3.2	Specification of an Area of Interest (AOI).	V2
3.2. 5.2.1.3.2.1	VPF FACC code(s).	V2
3.2. 5.2.1.3.2.2	Attribute values.	V2
3.2. 5.2.1.3.3	Retrieval of VPF data matching:	V2
3.2. 5.2.1.3.3.1	Product.	V2
3.2. 5.2.1.3.3.2	Area of Interest.	V2
3.2. 5.2.1.3.3.3	FACC codes	V2
3.2. 5.2.1.3.3.4	Attribute values.	V2
3.2. 5.2.2	Shall provide an Application Programming Interface (API) for rendering MCG&I data into a user independent data structure.	V2
3.2. 5.2.2.1	This data structure shall be an array of pixel values which point into a color table specifying the actual Red/Green/Blue values to use.	V2
3.2. 5.2.2.2	The data to be rendered shall be selectable via API calls.	V2
3.2. 5.2.2.3	The projection to use for rendering shall be selectable via API calls.	V2
3.2. 5.2.2.4	The rendering shall include all visualization capabilities provided by JMTK, such as perspective view, object overlay, etc.	V2
3.2. 5.2.2.5	The calling application will be responsible for the actual display of the data into their user interface.	V2
3.2. 5.2.3	Chart features displayed in the JMTK ECDIS chart window shall not be drawn with fewer picture units (i.e. lines pixels dot-pitch intervals) than when drawn on a 270 x 270 mm chart area at SENC scale.	V2
3.2. 5.2.4	A single CPU shall create a main tactical display on its monitor and may drive up to three auxiliary monitors and up to two large-screen displays.	V2
3.2. 5.2.5	At most two of these auxiliary displays shall be independent tactical displays with their own set of track filters and toggles.	V2
3.2. 5.2.6	In addition symbols shall be drawn with at least the same number of picture units as required to draw the symbol at the size defined in the Library even if this means oversize drawing for a screen with enlarged pixels.	V2

3.2. 5.2.7	That is the minimum height in picture units of a symbol is: (symbol height in mm) 0.312 mm (where 0.312 mm is the picture unit size for the minimum size chart display in S-52 Section 8 - Minimum Configuration).	V2
3.2. 5.2.8	There shall be the capability to configure for multiple display terminals.	V2
3.2. 5.2.8.1	There shall be one main display.	V2
3.2. 5.2.8.2	The remaining displays shall serve as slaves to the main display.	V2
3.2. 5.2.8.3	The auxiliary displays shall be controlled by the operator at the host computer or by a separate keyboard and track ball interface that shall provide for all standard capabilities.	V2
3.2. 5.3	**Performance.**	V2
3.2. 5.3.1	Shall generate and make available for display 1024 x 1024 pixels of MCG&I data within 5 seconds.	V2
3.2. 5.3.2	Shall compute and make available the coordinates and elevation of selected pixel within 1 second.	V2
3.2. 5.3.3	Shall generate and make available for display 1024 x 1024 pixels of NITF images data within 5 seconds.	V2
3.2. 5.3.4	Shall perform and make available for display pan and scroll operations within 5 seconds.	V2
3.2. 5.3.5	Shall perform and make available for display zoom operations within 3 seconds.	V2
3.2. 5.3.6	Shall generate and make available for display graphical perspective views within the times specified below.	V2
3.2. 5.3.6.1	Calculation of performance requirements for all types of perspective views shall be based on a 15nmi range, a 45 degree horizontal field of view, complete coverage of selected overlays, and a 1024 x 1024 pixel image.	V2
3.2. 5.3.6.2	Performance requirements are based on the area of terrain visualized, the various types of background and overlay data used, and the display quality elements selected.	V2
3.2. 5.3.6.3	Response times to calculate and make available for display a perspective view for a particular set of selections shall not exceed the time calculated according to Table A and B and the following procedure:	V2
3.2. 5.3.6.3.1	For each background or overlay option selected from Table A, sum the associated response times provided in the table to obtain a cumulative response time.	V2
3.2. 5.3.6.3.2	For each display quality option in Table B, multiple the associated performance factors to obtain a total performance factor.	V2
3.2. 5.3.6.3.3	Finally, multiply the cumulative response time by the total performance factor to obtain the total performance time.	V2
3.2. 5.3.6.3.4	The total time contributions from all overlay and back ground options, multiplied by all performance factor options, is the maximum response time requirement.	V2
3.2. 5.3.6.3.5	**Table A**, Overlay and Background response Time Contributions for Perspective View (all times are in seconds) Data Option / Response Time	V2

3.2. 5.3.6.3.5.1	DTED Level 1 / 1.2	V2
3.2. 5.3.6.3.5.2	DTED Level 2 / 13.5	V2
3.2. 5.3.6.3.5.3	VPF Feature Analysis Data / 0.1	V2
3.2. 5.3.6.3.5.4	VPF Vertical Obstruction Data / 0.1	V2
3.2. 5.3.6.3.5.5	ADRI/CIB / 30.0	V2
3.2. 5.3.6.3.5.6	Vector Maps / 0.1	V2
3.2. 5.3.6.3.6	**Table B**, Display Quality Options Performance Factors For Perspective Views. Quality Option / Performance Factor	V2
3.2. 5.3.6.3.6.1	Flat Shading / 1.0	V2
3.2. 5.3.6.3.6.2	Smooth Shading / 1.0	V2
3.2. 5.3.6.3.6.3	Diffused Lighting Model / 1.0	V2
3.2. 5.3.6.3.6.4	Visual Prediction / 1.0	V2
3.2. 5.3.6.3.6.5	Local Viewer Lighting Model / 2.0	V2
3.2. 5.3.6.3.6.6	Radar Prediction, all effects / 5.0	V2
3.2. 5.3.6.3.6.7	Visibility Attenuation / 1.5	V2
3.2. 5.3.6.3.6.8	Anti-aliasing / 4.0	V2
3.2. 5.3.7	Shall produce a single A size page print within 240 seconds.	V2
3.2. 5.3.7.1	No portion of the graphics display frozen (i.e. unavailable for update) for more than 5 seconds during the printing process.	V2
3.2. 5.3.8	Shall generate and display vertical profile views including earth surface and vertical obstructions less than 1.5 nmi. to the right and left of a 50 nmi. baseline within 5 seconds.	V2
3.2. 5.3.9	Shall load from a secondary storage media into the on-line MCG&I data files within one minutes.	V2
3.2. 5.3.10	Shall perform MCG&I data patch file updates to the on-line MCG&I data files within one minute.	V2
3.2. 5.3.11	The normal refreshed display shall be ready for quick draw in not more that one second.	V2
3.2. 5.3.12	A redrawn display generated by an operator action (such as a zoom) shall be ready for quick draw in not more than five seconds.	V2
3.2. 5.3.13	The toolkit should preserve the relative accuracy inherent in the source products. All geodetic calculations should use rigorous certified or de-facto standard algorithms.	V2
3.2. 5.3.13.1	All distance bearing projection calculations should be based ellipsoidal equation.	V2
3.2. 5.3.14	Enhanced J-Unit and Overlay Precision. Shall support a precision of 0.01 arc seconds for position data of J-Unit tracks and overlays. The precision will be supported both in memory and on disk for:	V2
3.2. 5.3.14.1	User interface.	V2
3.2. 5.3.14.2	Transmission.	V2
3.2. 5.3.14.3	Storage.	V2
3.2. 5.4.	**Security.**	V2
3.2. 5.4.1	Client/Server architecture. A multi-threaded server architecture capable of supporting multiple connections and displays simultaneously. This needs to be easily configurable.	V2

3.2. 5.5	**Shall perform coordinate and datum transformations**	V1
3.2. 5.5.1	Convert latitude longitude coordinates from one datum to another.	V1
3.2. 5.5.2	Convert a decimal degree to a radian value.	V1
3.2. 5.5.3	Convert an alphanumeric GEOREF coordinate to latitude/longitude.	V1
3.2. 5.5.4	Convert a lat/long coordinate to alphanumeric GEOREF.	V1
3.2. 5.5.5	Convert lat/long to numeric UPS coordinates.	V1
3.2. 5.5.6	Convert lat/long to numeric UTM coordinates.	V1
3.2. 5.5.7	Convert a latitude/longitude coordinate to an alphanumeric UPS coordinate.	V1
3.2. 5.5.8	Convert a latitude/longitude coordinate to an alphanumeric UTM coordinate.	V1
3.2. 5.5.9	Convert numeric UPS coordinates to lat/long.	V1
3.2. 5.5.10	Convert numeric UTM coordinates to lat/long.	V1
3.2. 5.5.11	Convert a radian value to decimal degrees.	V1
3.2. 5.5.12	Convert screen pixel positions to world (lat./long) positions.	V1
3.2. 5.5.13	Convert an alphanumeric UPS coordinate to a latitude/ longitude coordinate.	V1
3.2. 5.5.14	Convert an alphanumeric UTM coordinate to a latitude/ longitude coordinate.	V1
3.2. 5.5.15	Convert view surface coordinates to lat/long.	V1
3.2. 5.5.16	Convert lat/long to view surface coordinates.	V1
3.2. 5.5.17	Set the southwest and northeast coordinates of the area of interest.	V1
3.2. 5.5.18	Convert latitude/longitude to screen pixel positions.	V1
3.2. 5.5.19	shall support conversion of multiple coordinates	V1
3.2. 5.5.20	Re-initialize the system by reloading the named display configuration file.	V1
3.2. 5.5.21	Provide capability to display coordinate accuracy (CE 90%, LE 90%) and datum of each coordinate.	V2
3.2. 5.5.22	The coordinate conversion option shall permit the operator to manually type in or graphically select a sequence of coordinates in any of the three formats and determine equivalent values in the other two formats.	V2
3.2. 5.5.22.1	UTM	V2
3.2. 5.5.22.2	Latitude/Longitude	V2
3.2. 5.5.22.3	GEOREF	V2
3.2. 5.5.23	Values for all three formats (UTM, Lat/Long, and GEOREF) shall be displayed in a scrolling list.	V2
3.2. 5.5.24	The system shall allow coordinate conversion values to be printed in a report.	V2
3.2. 5.5.25	Datum transformations should be based on Abridged Molodenskiy equations.	V2
3.2. 5.5.26	All datums in DMA TM 8350.2 Table 7.5 should be supported. Default should be WGS-84.	V2
3.2. 5.5.27	UTM and UPS conversions should be based on DMA TM 8358.2.	V2
3.2. 5.6	**Shall support projection and datum transformations of all on-line spatial data bases.**	V1
3.2. 5.6.1	Polar stereographic	V1
3.2. 5.6.2	Transverse Mercator	V1

3.2. 5.6.3	Lambert conformal	V1
3.2. 5.6.4	Cylindrical equal-distant	V1
3.2. 5.6.5	Equal Arc-Second Raster Chart and Map (ARC)	V1
3.2. 5.6.6	Projection and datum transformations shall be based on	V1
3.2. 5.6.6.1	DMA technical manual 8358	V1
3.2. 5.6.6.2	DMA technical report 8350	V1
3.2. 5.6.6.3	USGS professional paper 1395	V1
3.2. 5.6.6.4	Transformation and coordinate conversions between all the datum listed in these three documents will be provided.	V1
3.2. 5.6.7	Transformations shall be based on spheroid and datum of input coordinate(s) and desired spheroid and datum of output coordinate(s)	V1
3.2. 5.6.8	A standard list of supported spheroids and datums can be requested and provided.	V1
3.2. 5.7.	**Production**	
3.2. 5.7.1	Shall have the capability to produce and save elevation tinted (color contour banded) depiction of the terrain data in 2-D (plan view).	V1
3.2. 5.7.1.1	Capability shall exist to determine the minimum and maximum elevations in the selected region.	V1
3.2. 5.7.1.2	Shall allow selectable map scale, AOI size, base elevation, interval size and interval colors in the generation of the elevation tinted maps.	V1
3.2. 5.7.1.3	Bathymetric contour coloring capability.	V2
3.2. 5.7.2	Shall have the capability to produce and save elevation shaded (light source relief shading) depiction of the terrain data in 2-D (plan view).	V1
3.2. 5.7.2.1	The light source position shall be selectable by the time and date of the desire	V1
3.2. 5.7.2.2	Shall select scale, AOI size, and light source (i.e. sun, moon) position by date and time or arbitrary placement (i.e. azimuth and declination).	V1

3.3 JMTK External Interface Requirements

DII working groups are identifying the external interface requirements among the COE areas. The JMTK will:

- be implemented using approved system APIs to support integration with the DII COE through the mission applications,
- be scaleable and provide a path for future upgrades, and
- provide users the same level of service (i.e., capabilities and responsiveness), regardless of their physical location in the distributed environment).

At this juncture, JMTK external interface requirements have been identified with the DII Internal Infrastructure, Embedded Functionality, and Mission Area Applications as shown in the next three paragraphs.

3.3.1 DII Internal Infrastructure (COE, Kernel, & Common Support Applications)

These include:

- Alerts,
- Messaging,
- Common Operating Picture,
- Office Automation,
- Presentation,
- Print Services, and
- Security/System Management.

3.3.2 DII Embedded Functionality

- Web browsers.

3.3.3 DII Mission Area Applications

- Application Programming Interface (API),
- Global Status of Resources and Training System (GSORTS),
- Global Transportation Network (GTN),
- Joint Defense Intelligence Support Services (JDISS), and
- Tactical Analysis Replanning Graphical Execution Toolbox (TARGET).

Additional interface identification and diagrams will be included in future versions of this SRS as the specific information becomes available.

3.3.4 CINC/Service/Agency (C/S/A) Unique Applications

Not applicable at this present time.

3.3.5 Site-Unique Applications

Not applicable.

3.3.6 Other DoD System Initiatives

Not applicable.

3.4 JMTK Internal Interface Requirements

All internal interfaces will be handled through the API calls.

3.5 JMTK Internal Data Requirements

The decisions related to internal data requirements are made by NIMA in coordination with JMTK developers.

3.6 Adaptation Requirements

The JMTK is a developer toolkit in which APIs and binaries have dependencies on the DII COE Kernel, COE Developer's Toolkit, and the COE Component Table segments. Toolkit modules will be provided for the import, display, and manipulation of digital MCG&I information. The toolkit provides functions necessary to render a common view of the battle space. The military services and agency users will be able to use the toolkit functions to meet operational needs.

3.7 Safety Requirements

JMTK software will not interfere with or defeat the purpose of, safety functions implemented in the host system.

3.8 Security and Privacy Requirements

DII COE Security Services will provide the JMTK security access. File access within the services of JMTK are controlled through the mission application. The user will be responsible for defining data as either local or global. The assumption is:

- All NIMA data are global, and
- Application specific data are local.

The security level is user invoked for user entered data. The JMTK has no specific security and privacy requirements. JMTK will support the marking of appropriate classification, privacy, and copyright levels.

3.9 CSCI Environmental Requirements

Ultimately, the JMTK is to be hardware independent and operate on a range of system platforms running under standards-based operating systems designated by DII (Refer to Paragraph 3.10.1 below).

3.10 Computer Resources Requirements

The JMTK will be compatible with DII-specified hardware and operating systems.

3.10.1 Computer Hardware Requirements

There is no hardware specific to the JMTK. The JMTK will be an open system capable of running on any DII COE approved platform. The approved Commercial off-the-shelf (COTS) platforms for DII 3.0 are Hewlett Packard (HP) 9000/700 series workstations and SUN SPARC 20/1000/2000 series workstations running under UNIX based operating systems.

3.10.2 Computer Hardware Resource Utilization Requirements

The following resource utilization information is provided:

- Total RAM: 256 MB of Shared Memory,

- Disk Space: 114 MB approximately (includes default data), 2 GB are recommended, and

- Input Devices: 4 or 8mm tape drive and CD-ROM.

3.10.3 Computer Software Requirements

In addition to the operating system software, the most recent version of the following software items are recommended for JMTK Mission Application Developers:

- X-Windows X 11R6,
- Developers' Motif: Version 1.2,
- FORTRAN,
- ANSI C and C++ compilers (current versions for HP, Sun, and the GNU compiler), and
- ADA Bindings

3.10.4 Computer Communications Requirements

The DII hardware and software components will be configured to meet specific user needs. JMTK computer communications requirements are being considered in the design of the DII architecture.

3.11 Software Quality Factors

The software quality factors that have already been put in place by the Military Services for CHART, CMTK and TEM that are represented in the JMTK will be assumed.

3.12 Design and Implementation Constraints

JMTK will be compatible with DII-specified platforms and operating systems. Presently, DII COE developmental release 3.2 consists of Sun Solaris Version 2.5.1 and HP UX Version 10.20 with OS compatible versions of X-Windows and Motif. The goal is that JMTK be compatible with DII COE documentation and guidelines and eventually support the DII objective architecture.

3.13 Personnel-related Requirements

The JMTK is a set of APIs and provides no direct user interface, although some of the helper applications for the visual domain use Motif-based dialog boxes. JMTK uses the standard default color map.

3.14 Training-Related Requirements

JMTK, as a toolkit, has no training requirements.

3.15 Logistics-related Requirements

NIMA will provide software support for the JMTK. The DISA Engineering Office will distribute the JMTK.

3.16 Other Requirements

Not applicable.

3.17 Packaging Requirements

Not applicable.

3.18 Precedence and Criticality of Requirements

Each military service or agency assigns their respective requirement precedence or criticality of requirement. Weights are to be assigned indicating the relative importance of each of the requirements in the JMTK functional requirements. The MCG&I Technical Working Group Voting Members will establish the order of precedence and criticality based on the services and agency priorities. The Voting Members are from:

- NIMA (Chair),
- DODIIS,
- US Air Force,
- US Army,
- US Coast Guard,
- US Marine Corps, and
- US Navy.

4.0 QUALIFICATION PROVISIONS

4.1 Qualifications Methods

JMTK will be qualified through formal validation test of the SRS level requirements on DII COE specified hardware platforms and operating systems. The components will be tested by the developers prior to their delivery to NIMA. NIMA will perform integration on the software provided by the participating Services in order to provide serviceable software to satisfy the MCG&I requirements. The Qualification Methods applied to the software may include test, demonstration, analysis, and inspection (T, D, A, I) as indicated in the Requirements Traceability Matrix in Section 5.

4.1.1 Demonstration (D)

The operation of the CSCI, or part of the CSCI, that relies on observable functional operation not requiring the use of instrumentation, special test equipment, or special analysis.

4.1.2 Test (T)

The operation of the CSCI, or part of the CSCI, using instrumentation or other special test equipment to collect data for later analysis.

4.1.3 Analysis (A)

The processing of accumulated data obtained from other qualification methods. Examples are reduction, interpretation, or extrapolation of test results.

4.1.4 Inspection (I)

The visual examination of CSCI code, documentation, etc.

4.1.5 Special Qualification Methods

Any qualification methods for the CSCI, such as special tools, techniques, procedures, facilities, and acceptance limits.

5.0 REQUIREMENTS TRACEABILITY

This section in the DID is to provide traceability of the MCG&I requirements to sources. DISA has modified this requirements paragraph so that the matrix provides a schedule of when functionality will be available and in which version.

Because this information changes over time and updates are required periodically, the material is provided in a separate document which may be attached as Appendix A.

The information will require revision upon approval of additional requirements by the Configuration Control Board.

6.0 NOTES

6.1 Acronyms and Abbreviations

ADRG	Equal ARC Digitized Raster Graphics
ADRI	Equal ARC Digital Raster Imagery
AID	Aeronautical Information Data
AITS	Adopted Information Technology Standards
AOI	Area of Interest
API	Application Programming Interface
C^4I	Command, Control, Communications, Computer, and Intelligence
C/S/A	CINC/Service/Agency
CAC	Compressed Aeronautical Chart
CADRG	Condensed Equal ARC Digitized Raster Graphics
CCM	Cross Country Movement
CHART	Charting and Mapping Module (US Navy)
CIB	Controlled Image Base
CMS	Common Mapping Standard
CMTK	Common Mapping Toolkit
COE	Common Operating Environment
COTS	Commercial-off-the-shelf
CSCI	Computer Software Configuration Item
DAFIF	Digital Aeronautical Flight Information File
DCHUM	Digital Chart Updating Manual
DCW	Digital Chart of the World
DFAD	Digital Features Analysis Data
DII	Defense Information Infrastructure
DISA	Defense Information Systems Agency
DMA	Defense Mapping Agency (now National Imagery and Mapping Agency)
DoD	Department of Defense
DoDIIS	Department of Defense Intelligence Information Systems
DT	Datum Transformation
DTED	Digital Terrain Elevation Data
DVOF	Digital Vertical Obstruction File
Dynapath	Dynamic Programming Path
FLIR	Forward Looking Infrared
FRD	Functional Requirements Document

GCCS	Global Command and Control System
GEOREF	Geographic Reference
GSORTS	Global Status of Resources and Training System
GTN	Global Transportation Network
HCI	Human-computer interface
HP	Hewlett Packard
IOC	Initial Operating Capability
ITD	Information Technology Division
ITD	Interim Terrain Data
JDISS	Joint Defense Intelligence Support Services
JMTK	Joint Mapping Toolkit
LE	Linear Error
LLLTV	Low Light Level Television
LOS	Line-of-Sight
MCG&I	Mapping, Charting, Geodesy, and Imagery
MCS	Modernized Catalog System (DMA/NIMA)
MGRS	Military Grid Reference System
NIMA	National Imagery and Mapping Agency
NITF	National Imagery Transmission Format
PITD	Planning Interim Terrain Data
PMP	Precise Monoscopic Positioning
PPDB	Point Positioning Data Base
PVOD	Probabilistic Vertical Obstruction Data
RPF	Raster Product Format
SAR	Synthetic Aperture Radar
SDBMS	Spatial Database Management System
SLF	Standard Linear Format
SMC	Surface Material Code
TAMPS	Tactical Aircraft Mission Planning System
TARGET	Tactical Analysis Replanning Graphical Execution Toolbox
TBD	To Be Determined
TEM	Terrain Evaluation Module (US Army)
UNIX	A computer operating system (originally developed by Bell Labs)
USA	United States Army
USAF	United States Air Force
USCG	United States Coast Guard

USGS	United States Geological Survey
USMC	United States Marine Corps
USN	United States Navy
UTM	Universal Transverse Mercator
VMAP	Vector Smart Map
VPF	Vector Product Format
WVS	World Vector Shoreline

6.2 Glossary

NOTE: Terms in the MIL-HDBK-850 Glossary of Mapping, Charting, and Geodesy are not duplicated here.

Analysis. The processing of accumulated data obtained from other qualification methods. Examples are reduction, interpretation, or extrapolation of test results.

Architecture. The organizational structure of a system or CSCI, identifying its components, their interfaces, and a concept of execution among them.

Automated Information System. Computer hardware, computer software, telecommunications, information technology, personnel, and other resources which collect, record, process, store, communicate, retrieve and display information.

Click(ing). Quickly pressing a mouse button in order to make a selection or give a command.

Commercial-Off-the-Shelf (COTS). A description which characterizes a commercial, available, supported product which is offered for sale, by a vendor, for a price. Commercial products are developed to meet perceived or actual market requirements. Product development and evaluation are typically funded through the company's research and development budget and from revenues derived from selling and supporting the product, respectively.

Computer Software Configuration Item (CSCI). An aggregation of software that satisfies an end use function and is designated for separate configuration management by the acquirer. CSCIs are selected based on tradeoffs among software function, size, host or target computers, developer, support concept, plans for reuse, criticality, interface considerations, the need to be separately documented and controlled, and other factors.

Configuration Management (CM). A discipline applying technical direction and auditing practices to identify and document the functional and physical characteristics of a configuration item, to control changes to those characteristics, and to formally record and report change processing and implementation status.

Database. A logically connected collection of data. A set of dictionary tables and user tables that are treated as a unit.

Database Management System (DBMS). A set of programs that provide for the input, retrieval, formatting, modification, output, transfer, and maintenance of information in a database.

Data Dictionary. A special file containing the names of all fields in all files maintained by the Database Management System. For each file in the database, the data dictionary always includes the name of each field, type of data stored in each field (such as text, numeric, date, or dollars), and width of each field.

Demonstration. The operation of the CSCI, or a part of the CSCI, that relies on observable functional operation not requiring the use of instrumentation, special test equipment, or subsequent analysis.

Design. Those characteristics of a system or CSCI that are selected by the developer in response to the requirements. Some will match the requirements; others will be an elaboration of the requirements, and others will be implementation related.

Documentation. Any written information that describes hardware or software, including tutorial lessons, reference manuals, pocket reference guides, and so forth.

Environment. A set of parameters defining various display, editing, and data manipulation conditions that remain active during a session until explicitly changed by the user.

File(s). A collection of related records. Also, a named collection of bytes on a disk. A file is a storage area used to store all database data.

Graphical User Interface (GUI). Allows a user to specify actions by dragging and dropping, or pointing and clicking on an icon.

Icon. A pictorial metaphor (representation) of the object being acted upon.

Information. Any communication or representation of knowledge such as facts, data, or opinions, in any medium or form, including textual, numerical graphic, cartographic, narrative or audiovisual forms.

Inspection. The visual examination of CSCI code, documentation, etc.

Integration Testing. Testing that is specifically aimed at exposing the problems that arise from the combination of components.

On-line. Any device that is under the direct control of the computer.

Open System Environment. The comprehensive set of interfaces, services, and supporting formats, plus user aspects of interoperability or portability of applications, data or people, as specified by information technology standards and profiles.

Open System. A system that enables properly implemented applications to run on a variety of platforms from multiple vendors, interoperate with other systems' applications, and present a consistent style of interaction with the user.

Qualification Testing. Testing performed to demonstrate to the acquirer that a CSCI or a system meets its specified requirements.

Regression Testing. Any repetition of tests (usually after software or data exchange) intended to show that the software's behavior is unchanged except insofar as required by the change to the software or data.

Requirement. A characteristic that a system or CSCI must possess in order to be acceptable to the acquirer.

Software. Computer programs and computer databases.

Software product. Software or associated information created, modified, or incorporated to satisfy a contract. Examples include plans, requirements, design, code, databases, test information, and manuals.

Software System. A system consisting solely of software and possibly the computer equipment on which the software operates.

Software Test Environment. The facilities, hardware, software, firmware, procedures, and documentation necessary to perform qualification, and possibly other, testing of software. Elements may include, but are not limited to simulators, code analyzers, test case generators, and path analyzers, and may also include elements used in the software engineering environment.

Standard. An accepted set of norms or criteria for the design or implementation of information processing or computing systems hardware, software, and associated components. A typical feature of information processing standards is the specification of published interfaces for services or connections to a hardware or software component. Conformance to standards is designed to achieve commonality and interoperability among components and systems and to avoid the design of “one-of-a-kind” systems that are expensive to implement and maintain.

Test Failure. A test is failed when the test, the test environment, the execution, and the validation process are known to be correct and the software does not pass one of its validation criteria. Note that it was the software that failed, not the test. The test succeeded.

Test. The operation of the CSCI, or part of the CSCI, using instrumentation or other special test equipment to collect data for later analysis.

Validation. The process of evaluating software at the end of a software development process to ensure compliance with requirements.

APPENDIX A: Requirements Traceability Matrix

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